



Nonpoint Source

News-Notes

*The Condition of the Water-Related Environment
The Control of Nonpoint Sources of Water Pollution
The Ecological Management & Restoration of Watersheds*

Fond Farewell to Terrene Institute

After publishing *Nonpoint Source News-Notes* since its humble beginnings in 1989, Terrene Institute will be phasing out some of its programs and saying goodbye to *Nonpoint Source News-Notes*. Terrene's Executive Vice President, Judy Taggart, has decided to retire and rest on her well-earned laurels.

Some programs and publications will go to other organizations, such as the popular *Lake Pocket Book*, which will now be available from the North American Lake Management Society (www.nalms.org). And the National Mitigation Banking Conference will be managed in cooperation with Terrene by JT&A, inc. at www.mitigationbankingconference.com. Visit www.terrene.org for more information on Terrene programs and publications.

News-Notes will continue to be published by the Nonpoint Source Branch of the U.S. Environmental Protection Agency's Office of Wetlands, Oceans, and Watersheds. It will continue to be available on EPA's web site at www.epa.gov/owow/nps.

The staff of *News-Notes* will miss the dedication and hard work of Terrene to water pollution prevention and wish Judy and her staff at Terrene all the best!

Inside this Issue

Commentary

Raising Volunteer Monitoring to New Heights 2

Special Focus: Volunteer Monitoring

Hold the Date! October 18 is National Water Monitoring Day 3

"Success" Issue of Volunteer Monitor Released 4

EPA's Online Directory of Volunteer Programs 4

Washington's New Monitoring Resources 5

Join a Volunteer Monitoring Listserv 6

Volunteers Help Keep Their Waters Clean 6

Pennsylvanians Develop Volunteer Monitoring Database 8

Teaching the Adults of Tomorrow 8

Applying GREEN's Resources to the Classroom 9

Volunteers Dip-In 9

Volunteers Map Nitrogen Distribution 10

Volunteer Wetland Monitoring: An Introduction and Resource Guide . . . 12

News from States, Tribes, and Localities

New Mexico Artists: Friends of the Wild Rivers 12

Halifax Harbor: Shining Example of a Clean Marina 13

Notes on Watershed Management

Storm Water Programs Reach Out to the Public 14

New Program Helps Developers Build Better 16

Working to Manage Watersheds Locally 17

New Watershed Project Management Guide 19

Agricultural Notes

Creating the Monterey Bay Farmers' Clean Water Initiative 19

Nutrient Trading Tools for Cleaner Water 21

Rice Farmers Hold Winter Water on Fields for Triple Win 22

Technical Notes

Observations on Technical Achievability in TMDL Development 23

Sediment Sampling Instrumentation Now Available to the Public 26

Notes on Education

Washington State Features Exceptional Environmental

Education Resources 26

Sharon and Beginning Readers Search for the Environment 27

Be Prepared to Restore! 27

Reviews and Announcements

National Coastal Condition Report 28

Terrene Institute Releases New Puzzle 29

Onsite Wastewater Treatment Systems Manual Released 29

Road Maintenance Training Video Set 29

Web Sites Worth a Bookmark 30

DATEBOOK 30

THE COUPON 31

Commentary

Raising Volunteer Monitoring to New Heights

By Jeff Vonk, Director of the Iowa Department of Natural Resources

Because little historical data exist on the quality of America's streams, rivers, and lakes, there is a need for state and federal agencies to seek information on surface water quality to address land-use management decisions. Local policymakers and public conservation coalitions need to focus attention on the ecological health of surface waters for help in addressing human health concerns, tourism, and nonpoint source pollution from confined animal feeding operations, agricultural and non-agricultural fertilizer and pesticide use, and soil erosion. In Iowa specifically, most of the state's 72,000 miles of streams remain unmonitored by professionals. This raises a question: how can we even begin to address these concerns if we don't have the data we need? For Iowa, part of the answer lies in volunteer monitoring.

In 1996 the Iowa Environmental Council, a nonprofit organization dedicated to protecting Iowa's natural environment, began a voluntary water quality monitoring program. In 1998 the Iowa Department of Natural Resources (DNR) built on the Council's success, and along with the Iowa Division of the Izaak Walton League, Iowa Farm Bureau, Natural Resources Conservation Service, and the University of Iowa Hygienic Laboratory launched a statewide volunteer monitoring program called IOWATER. The program has been the pride and joy of the Iowa DNR since its start. In fact, more than 25,000 volunteer hours have been logged under IOWATER, the equivalent of well over a quarter million dollars. And of course, its potential value to planning and water quality improvement can be priceless in a state leading the nation in the production of pork, poultry (eggs), corn, and soybeans. A state with extraordinary agricultural and industrial output demands extraordinary measures to protect water quality. Iowa's citizens — from businesses to farmers to school teachers — meet that challenge through the IOWATER program.

IOWATER, a vital component of the Iowa DNR Ambient Monitoring Program, allows citizen monitors to fill in the gaps in water quality information. The collection of this supplemental data by concerned citizen volunteers not only aids decision-making when it comes to funding priority water quality initiatives or managing growth, it also provides valuable public education and, perhaps most importantly, contributes toward personal ownership and responsibility for both problems and solutions — two factors key in the fight against nonpoint source pollution. Water quality continues to be one of the top environmental concerns of Iowa's citizens, and IOWATER provides an opportunity for citizens to actively protect Iowa's water quality through monitoring.

IOWATER sponsors two levels of training in classrooms and streams across the state. Level 1 teaches biological, chemical, physical, and stream habitat assessments. Level 2 provides specific tips for designing a monitoring program, preparing a Quality Assurance Project Plan, and establishing data interpretation methods. Hands-on streamside sessions cover monitoring for chloride, general coliform, and *E. coli* bacteria. Advanced Level 2 modules offer specific types of monitoring such as benthic macroinvertebrate indexing, standing water, and soil. Since the program's inception, more than 1,100 volunteers have been trained at Level 1 workshops and 150 volunteers at Level 2 workshops. More than 230 participants have participated in the advanced Level 2 modules.

IOWATER doesn't end when the data have been collected and the hip waders hung up to dry. Trained IOWATER volunteers submit their data to an online database where they register monitored sites, submit collected data, and access data collected by others. Data can be searched and retrieved by site, county, or watershed, or by using a map-based Arc-View Geographic Information System program. As of April 2002, volunteers had registered more than 800 monitoring sites.

Early comparison of the volunteer data to that being collected professionally by the Iowa DNR and the University of Iowa Hygienic Laboratory shows a good match in overall trends. Testing methods used by the IOWATER program and the data collected by volunteer monitors will continue to be evaluated, and changes to testing procedures will be made where necessary.

IOWATER data will also be available soon to water quality and land use professionals through the Iowa DNR and EPA's STORET database.

So what are the ingredients needed to start a successful statewide volunteer monitoring program in other states? First and foremost, states need dedicated funding to pay for full-time staff to lead and carry the program. State water quality professionals are often pulled in so many directions they do not have time to sustain such a program. States will need to identify and hire full-time experienced staff dedicated to the program. Secondly, states should design their programs to be as flexible as possible. That may mean flexibility in terms of program oversight, responsibilities, or allowing local groups to design their own monitoring and action plans. For example, IOWATER volunteers and program staff discuss various monitoring strategies, but ultimately the volunteers decide the monitoring location, frequency, and technique.

Another key ingredient for a successful volunteer monitoring program is the oversight and guidance of an advisory committee. IOWATER is overseen by an Executive Committee that includes the Iowa Department of Agriculture and Land Stewardship, Iowa Farm Bureau, University of Iowa Hygienic Laboratory, Iowa Chapter of the Izaak Walton League, USDA Natural Resources Conservation Service, Iowa Association of Naturalists, Iowa Conservation Education Council, and the Iowa Environmental Council. A larger technical advisory committee meets twice annually and consists of volunteer monitors and several other conservation, educational, and agricultural organizations in Iowa. The technical advisory committee provides direction for future needs and offers support for present efforts.

Perhaps the most important ingredient in the IOWATER program is how it is perceived by its citizen monitors. It may be a cliché, but it is true — IOWATER is truly a program by the people for the people. IOWATER is not a government program with citizen involvement; it is a citizen-based program with government involvement. The government merely provides a framework so that citizens can use the information to actively promote responsible local decision-making in protecting water quality. The program is directed by the needs of local communities and individual volunteers within Iowa's communities. Whether it is a ninth grade class testing water once a year, a conservation club testing several sites monthly, or a concerned farmer monitoring a stream adjoining his field, everyone's needs are taken into account.

IOWATER will continue to educate the public about watersheds and water quality. This statewide comprehensive and organized approach is promising a strong foundation for uncovering the many stressors that affect watersheds. More complete data help determine what actions are needed to protect or restore the resource. Watershed monitoring builds a sense of community, increases commitment to meeting environmental goals, and ultimately, improves the likelihood of success for environmental programs. IOWATER is making "waves of difference" across Iowa.

[The Iowa Department of Natural Resources administers and primarily funds IOWATER through state and federal monies. For more information, contact Rich Leopold, IOWATER Coordinator, Wallace Office Building, 502 E. 9th Street, Des Moines, IA 50319. Phone: (515) 281-3252; e-mail: richard.leopold@dnr.state.ia.us; Internet: www.iowater.net.]

Special Focus: Volunteer Monitoring

Hold the Date! October 18 is National Water Monitoring Day

October 18 is the 30th anniversary of the signing of the Clean Water Act. To mark the occasion, and as part of the celebration of 2002 as the Year of Clean Water, volunteer monitors, water quality professionals, students, government leaders, and the public will head out to monitor local streams, lakes, beaches, wetlands, and bays. National Water Monitoring Day will also include stream and beach cleanups, educational events, and water festivals.

National Water Monitoring Day was designed to educate the public about watersheds, pollution, and the importance of monitoring; build better collaboration between professionals and volunteer water monitors; and celebrate the role of volunteer monitors and the accomplishments of the Clean Water Act.

Hold the Date!
October 18 is
National Water
Monitoring Day
(continued)

Participants will use a simple National Water Monitoring Day kit that can be purchased for \$16.75 through the Year of Clean Water web site at www.yearofcleanwater.org (the kit can be used to test up to 50 samples) to test for temperature, pH, dissolved oxygen, and water clarity. Trained volunteer monitors and professionals will use their usual methods for technique and equipment and may monitor a broader range of water quality conditions.

To support the monitoring effort, Earthforce/GREEN, a national youth-based environmental monitoring and civic action organization, has adapted its volunteer database to accept National Water Monitoring Day data. Data will not be quality-assured or extensively analyzed, since parameters and methods were selected primarily because of simplicity and safety, and data will come from volunteers with a wide range of training. The database will map monitoring site locations and accommodate some digital photos of sites and events.

The event's primary sponsor, America's Clean Water Foundation (ACWF), leads a steering committee composed of representatives from state and federal agencies, volunteer monitoring groups, and national environmental groups. ACWF plans to produce a national report summarizing and celebrating the event and expects state water quality agencies to also contribute special discussions of their water quality conditions.

[For more information on National Water Monitoring Day, visit the ACWF's Year of Clean Water web site at www.yearofcleanwater.org. For questions on EPA's National Water Monitoring Day role and activities, contact Alice Mayo, National Volunteer Monitoring Coordinator, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, (4503T), Washington, DC 20460. Phone: (202) 566-1184; e-mail: mayio.alice@epa.gov.]

"Success" Issue of *Volunteer Monitor* Released

The long-awaited "Success Stories" issue of the *Volunteer Monitor* has just been released. This expanded special issue is aimed at a wide audience and timed to coincide with National Water Monitoring Day (October 18, 2002). It's perfect for handing out at public events, watershed festivals, etc., to show the world what volunteer monitors can accomplish.

Some of the volunteer monitoring successes include the following:

- ◆ Phosphorus testing helps protect scenic New Hampshire lake from highway impacts;
- ◆ Temperature data lead to restoration project to keep trout cool;

- ◆ 100,000 acres of Maine clam flats opened for harvest with help from volunteer monitors;
- ◆ Algal blooms on Rhode Island ponds clear up after volunteers trace source of excess nutrients;
- ◆ Scientists make use of extensive volunteer-collected database on Florida lakes to develop regional framework for lake management;
- ◆ And many more!

To place an order, send an e-mail to ellieely@earthlink.net with name, organization's name, address (no P.O. boxes), and requested number of copies. Printing and shipping costs apply. For more information, contact Eleanor Ely at (415) 334-2284.

EPA's Online Directory of Volunteer Programs

Want to know more about volunteer monitoring programs in your area?

Check out yosemite.epa.gov/water/volmon.nsf for information on more than 800 volunteer water monitoring programs underway across the United States. View programs by state or program name, and add (or edit) your own information. Each entry lists program contacts, parameters and environments monitored, and approximate number of volunteers. Many entries also include information on quality assurance plans, budget, data users, and much more.

EPA first collected volunteer monitoring program information in 1988; the directory listed fewer than 50 programs. Ten years later, the most recent directory listed 772 programs. EPA now accepts updates to the database online. Work is underway to make the directory more searchable and to summarize updated statistics about existing programs. A summary of the printed 1998 edition is available at www.epa.gov/owow/monitoring/dir.html.

[For more information on the directory or EPA's volunteer monitoring program, visit www.epa.gov/owow/monitoring/vol.html.]

Washington State's New Monitoring Resources

Volunteer monitors in Washington State can now report their water data in the online NatureMapping database. A statewide education program hosted by the University of Washington, fosters environmental monitoring of wildlife, water, and other natural resources. The database was developed in response to a 1996 Washington Department of Ecology (Ecology) survey, which revealed that more than 12,000 students and adults across the state actively participated in monitoring projects. The survey indicated that the volunteers' biggest need, after funding and training, was a permanent, statewide, central repository for their data.

NatureMapping launched the instantly successful online data bank two and a half years ago. "It's fun and easy to use," said Annie Phillips with Ecology. By May 2002, the database stored information from 95 organizations, and participation continues to grow. Many of these organizations report both current and historical data from multiple monitoring sites.

Reporters categorize their data at four different levels depending on the monitor's type of quality assurance plan. "Basically speaking, Level 1 has no quality assurance plan," explained Phillips. "Level 2 has an informal plan, but it's not very project-specific. Level 3 follows a specific written plan. Level 4 follows the specific, written plan, but it also describes how the monitoring follows the plan's objectives. We developed this method to characterize data quality years ago, and it's been adapted by many states and programs."

The state now uses volunteer data to help characterize water quality. Ecology plans to include Levels 3 and 4 data from the NatureMapping web site in its 2002 integrated water quality assessment report. According to Phillips, "the integrated report has a new listing category called *Waters of Concern*, where the data doesn't need to meet rigorous requirements. Waters of concern are like red flags — problems for professional monitors to keep an eye on."

Using the Site

Users may access the program at www.cbr.washington.edu/naturemapping. To submit data, a reporter must first locate the site by using the zoom-in interactive maps. The reporter then describes surrounding land uses, vegetation types, substrates, etc., and can use a form to report information about the group itself, including monitoring descriptions, operational quality levels, and contact information. The reporter can also provide information on restoration projects, photos, and related web links. For each reported measurement, the user must select the measurement method from a drop-down menu. This gives further indication of the data's credibility. To review data, users click on a map or view a listing of sites and scroll down to customize the monitoring project table (by group name, waterbody name, expertise level, location, etc.).

The program still has limitations. Although participants have little trouble reporting data, viewing submitted data is a different story. "Looking at the data is pretty awkward, and comparing measurements between sites or over time is downright impossible so far. Karen Dvornich, who created the NatureMapping program, is seeking funding to update the user interface and add other enhancements to make the database easier to manipulate and view," explained Phillips.

Other Online Volunteer Monitoring Resources

In addition to the NatureMapping data repository at the University of Washington, Ecology maintains another web site, Watch over Washington (www.ecy.wa.gov/apps/wow), that provides volunteer monitors with updated information about news, educational and technical resources, events, and reports. This comprehensive support system helps Washington State guarantee that citizens will continue to generate good quality data.

[For more information contact Annie Phillips, Washington State Department of Ecology, P.O. Box 47600, Olympia, WA 98504-7600. Phone: (360) 407-6408; e-mail: aphi461@ecy.wa.gov.]

Join a Volunteer Monitoring Listserv

Need someone to talk to about your volunteer monitoring project?

Try the Volmonitor Listserv. It's a national listserv for volunteer monitors that was established by EPA to encourage communication and information exchange among the nation's growing number of volunteer environmental monitoring programs. You will receive news on upcoming conferences, workshops, special events, and new publications. It also serves as a discussion forum and networking tool for volunteer monitors of all types to ask and respond to questions about volunteer monitoring methods, data quality, data management issues, and more. So whether your group monitors wetlands, streams, or lakes, sign up and get in the loop. To subscribe, send an e-mail to listserv@unixmail.rtpnc.epa.gov with the following in the message body: subscribe volmonitor lastname firstname. Leave the subject line blank. You will receive a welcome message once subscribed.

Washington State also hosts e-mail listservs for volunteer monitors. In August 2000 the Washington Department of Ecology developed the Volunteer Monitor and NatureMapping/Watch Over Washington listservs to support volunteer monitors and keep stakeholders informed. The Volunteer Monitor Listserv encourages communication between volunteers and project coordinators personally active in Washington State. Other volunteer monitors, coordinators, teachers, and people working on restoration projects across the country use the NatureMapping/ Watch Over Washington Listserv. Both listservs, with more than 250 members in the NatureMapping and more than 350 members in the Volunteer Monitor, host daily participation and provide substantial information for volunteer monitors. Both listservs announce volunteer monitoring events, job opportunities, training sessions, and more.

To subscribe to the Volunteer Monitor Listserv, visit listserv.wa.gov/cgi-bin/wa?SUBED1=volunteer-monitors&A=1, and visit listserv.wa.gov/cgi-bin/wa?SUBED1=naturemapping&A=1 to subscribe to the NatureMapper/Watch Over Washington Listserv.

Volunteers Help "Keep" Their Waters Clean

While monitoring your local river, you find a problem. Perhaps you see a large sediment plume clouding the water. Whom do you contact? How do you know whether the contacted agency will have the time to follow up, let alone address the problem? If you are one of the thousands of volunteers working with a Waterkeeper program, you no longer have to ask these questions. Each Waterkeeper program addresses one or more waterbodies and employs a full-time, privately funded, nongovernment employee (known as the Waterkeeper). The Waterkeeper advocates compliance with environmental laws, responds to citizen complaints, identifies problems that affect the waterbody, and devises appropriate remedies to address the problems. By adding this layer of citizen action to the existing network of volunteers, Waterkeeper programs make a difference in local communities.

Different Waterkeepers, Different Waters

Waterkeeper groups are springing up around the country. To find out whether a Waterkeeper program is active in your area, check the complete listing of programs at www.waterkeeper.org/PBK/keepers/keeper_find.asp. The following lists a sample of the Waterkeeper program's diverse locations and program names:

- ◆ Assateague Coastkeeper, Maryland
- ◆ Black Mesa Waterkeeper, Arizona
- ◆ Buzzards Baykeeper, Massachusetts
- ◆ Clinton Streamkeeper, Ohio
- ◆ Cook Inletkeeper, Alaska
- ◆ Delaware Riverkeeper, Pennsylvania, New Jersey, Delaware, and New York
- ◆ Great Salt Lakekeeper, Utah
- ◆ Nicoya Gulfkeeper, Costa Rica
- ◆ Sacramento-San Joaquin Deltakeeper, California
- ◆ Village Creekkeeper, Alabama

Waterkeeper Origins

The Waterkeeper concept began on New York's Hudson River when a coalition of commercial and recreational fishermen mobilized in 1966 to rescue the river from its polluters. In 1983, these local activists launched the first Riverkeeper program, constructed a boat to patrol the river, hired the first full-time public advocate, and began filing lawsuits against municipal and industrial polluters. By 1998 the Hudson Riverkeeper had filed more than 150 successful legal actions against Hudson River polluters. Largely as a result of this work, the Hudson thrives once again.

Today's Waterkeepers share the same public advocacy function as the Hudson Riverkeeper, but they don't all pursue litigation as a first choice. Each Waterkeeper creates a strategy that meets the needs of his or her local area. Most Waterkeepers focus on conducting water quality monitoring, participating in planning and public education, and devising solutions with polluters. When necessary, Waterkeepers pursue litigation as a final step to enforcement.

A World Network of Waterkeepers

Almost 90 Waterkeeper programs in North America and other countries actively participate in the Waterkeeper Alliance. The Alliance approves new Waterkeeper programs, licenses use of the Waterkeeper program name, supports, assists, and represents Waterkeepers working on issues of national interest, and maintains a Waterkeeper information exchange.

"Every Waterkeeper program is completely autonomous," explained Alisa Hilfinger of the Waterkeeper Alliance. "We don't dictate an individual program's activities. We know that the member programs are more capable of dealing with issues on the local level. They know the area, what the problems are, and how best to solve those problems. The Alliance is here to enhance their work. The Alliance's job is to support their efforts by strengthening the Waterkeeper name, concept, and influence."

Waterkeeper Wins in Delaware River Watershed!

The Delaware Riverkeeper Network (DRN), home and support organization for the Delaware Riverkeeper, serves as a good example of how the Waterkeeper concept facilitates volunteer monitor efforts to assess and improve the health of local watersheds. The Delaware Riverkeeper supports diverse volunteer monitoring programs throughout the Delaware River watershed. The group has a complex network of both volunteer and paid staff, which ensures that someone is always available to help address volunteer monitors' general and specific questions. "The Delaware Riverkeeper's monitoring programs are designed to inform people and to encourage them to take action," said Maya van Rossum, the Delaware Riverkeeper.

The Delaware Riverkeeper encourages and supports different types of volunteer monitoring, including chemical, biological, and visual parameters, depending on the monitoring goals. When the monitors detect a problem, the Delaware Riverkeeper works with them to find and address the source. "In one case we brought a citizens' suit against a polluter — which we won," noted van Rossum. "In other cases we initiated education programs or reported the problem to the appropriate agency and ensured they took the appropriate action, including issuing fines."

The Delaware Riverkeeper tries to be proactive and not collect data "for data's sake," explained van Rossum. "We work closely with our volunteer monitors to identify monitoring goals and establish a plan of action for achieving those goals. This is the direction that all monitoring should go. Identify your goal, and structure your monitoring program accordingly." In one watershed, for example, the monitors were most concerned about excessive sediment pollution from a variety of sources, including construction sites and poorly maintained streambanks. DRN staff worked with them to develop a local monitoring program, asking volunteers to collect visual data about the location of apparent sediment pollution sources. The monitors presented data in a report to watershed landowners and local government agencies that described how landowners can report sediment and erosion control violations and identify sediment sources. Delaware Riverkeeper volunteers now work with some of the landowners to solve their erosion problems through restoration and also help municipalities strengthen sediment pollution control ordinances.

The Delaware Riverkeeper wants all volunteer monitoring data to be used to its fullest potential and is working to get the Pennsylvania, New Jersey, New York, and Delaware state agencies to use volunteer data. "We believe volunteer data should play a key role in the TMDL process. Most states don't have the resources to monitor all of their stream miles. Our volunteer data can help state agencies target the waterbodies they should be assessing. Unfortunately, the states have been reluctant to use volunteer data despite the fact that our monitors are trained and follow EPA-approved protocols. We plan to work with all the states in the Delaware River watershed until they understand the benefits that volunteer data can provide." In the meantime, the Delaware Riverkeeper will continue to help citizens act to improve water quality in their communities.

[For more information about Waterkeeper Alliance, contact Alisa Hilfinger, Program Coordinator, Waterkeeper Alliance, 828 South Broadway, Suite 100, Tarrytown, NY 10591. Phone: (914) 674-0622 x208; e-mail: info@waterkeeper.org; Internet: www.waterkeeper.org. For more information about the Delaware Riverkeeper, contact Maya van Rossum, P.O. Box 326, Washington Crossing, PA 18977-0326. Phone: (215) 369-1188, e-mail: keeper@delawareriverkeeper.org; Internet: www.delawareriverkeeper.org.]

Pennsylvanians Develop Volunteer Monitoring Database

Thousands of citizen monitors around the Commonwealth of Pennsylvania now have a repository for their water quality data. The Environmental Alliance for Senior Involvement (EASI), the Pennsylvania Department of Aging, and the Pennsylvania Department of Environmental Protection have joined forces to develop the state's first citizen volunteer water monitoring database. Located online at www.environmentaleducation.org/default.lasso, the system contains two major components. The first component, the Pennsylvania Senior Environment Corps (PaSEC) database, compiles information from monitors using mandatory indicators, and the second component, the Citizens' Volunteer Monitoring Database, hosts data from groups using their own indicators and monitoring techniques.

The PaSEC database accepts data from PaSEC members and any other group using standardized protocols. The protocols include pH, conductivity, water temperature, dissolved oxygen, nitrates, total phosphates, and sulfates. A habitat assessment and water quality rating, based on benthic macroinvertebrate (bottom dwelling species) sampling, are also part of this component.

The Citizens' Volunteer Monitoring Database can be used by any volunteer monitor using his/her own protocols and quality control plans. Data fields include the above mentioned seven physical and chemical indicators as well as water hardness, turbidity, chloride, chlorophyll *a*, total dissolved solids, total suspended solids, aluminum, manganese, iron, fecal coliform, and Secchi depth.

[For more information on the PaSEC database, contact Elizabeth Grove, the PaSEC Statewide Coordinator, 2998 Cape Horn Road, Red Lion, PA 17356-9067. Phone: (717) 244-6248; e-mail: PaGreatSEC@aol.com. For more information on the Citizens' Volunteer Monitoring Database, contact EASI, P.O. Box 250, Catlett, VA 20119-0250. Phone: (540) 788-3274; e-mail: easi@easi.org.]

Teaching the Adults of Tomorrow

The nonprofit groups Earth Force and Global Rivers Environmental Education Network (GREEN) have teamed up to offer young water quality monitors and environmental educators a network of support and information resources. Earth Force develops innovative tools for educators to use to engage young people in community environmental problem solving. GREEN, a subset of Earth Force, offers educators and watershed organizations services and tools to engage youth in monitoring and addressing water resource problems.

GREEN's water quality monitoring resources are targeted at educators looking to protect their rivers, streams, lakes, and oceans. GREEN communicates with educators primarily through its interactive web site at www.green.org. The educators may sign up for an e-mail discussion group and an e-mail newsletter. Educators can also download a series of monitoring and other water information resources for free, including *Background on Chemical Parameters*, *Background on Biological Monitoring*, *Making Water Quality Connections*, *Connecting Watershed and Community*, *Understanding Watersheds*, and more.

The web site also allows educators to help youth monitors enter, track, and share their project data. The site offers many links, such as EPA's *Surf Your Watershed*, to help youth monitors research information about their watershed. Once they develop a project and begin collecting data, they register their project online for free and enter the data (chemical, physical, benthic data, and/or land, water, and physical inventory data) directly onto the web site. The students can track the progress of their project through online project logs, which can be shared with all project participants and other interested parties. The students can also maintain a common project calendar to coordinate group efforts. The site allows each group to personalize its site with pictures of the group in action and maps identifying the exact monitoring spot.

GREEN also sells educator materials and monitoring equipment through its web site. GREEN offers many different books and teaching guides including *Field Manual for Water Quality Monitoring — 12th Edition*, GREEN's latest comprehensive monitoring guide, and *Protecting our Watersheds*, a package to help educators guide students in correcting problems discovered in their

watershed. GREEN also sells diverse water quality monitoring equipment varying from a \$30 start-up kit to a \$400 advanced kit. Educators can also order one-on-one training on the technical aspects of water monitoring and how to take action to correct problems.

[For more information contact Kris MacCubbin, Earth Force, Communications Marketing Director, 1908 Mount Vernon Avenue, 2nd Floor, Alexandria, VA 22301. Phone: (703) 299-9400; e-mail: kmaccubbin@earthforce.org; Internet: www.earthforce.org.]

Applying GREEN's Resources to the Classroom

The 9th grade advanced technology students at Penn Wood West Junior High School in Darby, Pennsylvania, are looking for insects in decayed leaves taken from a local creek. So why are students studying bugs in a technology class? "It was a great opportunity to show students how technology could be used in real-world situations," teacher George Ambrose recalls. "I decided to share my passion for ecology with my students. To prepare, I looked for opportunities to partner with people already doing good things. Earth Force was one of the best that I found."



Students in ninth grade advanced technology class at Penn Wood West.

Using materials provided by the Philadelphia Earth Force office, including the new GREEN action curriculum *Protecting Our Watersheds*, the class focused on their local watershed. "Before we did our assessments, students predicted that very few species, if any, lived in the creek," reports their teacher. "They were enthralled by the number and varieties of living creatures that we did find."

Back in the computer lab, students investigated the data. They wrote reports and letters to agencies requesting general information and clarification on existing regulations. They searched the Internet for definitions, facts, background articles, published reports, news stories, and other relevant information. They also compiled and analyzed their benthic and chemical water quality data in a spreadsheet. Students used the assembled information to prepare reports for classroom presentations and a display at the local library's "Science in the Summer" program. Finally, the students used videoconferencing equipment to collaborate with other schools on their projects.

The students have been motivated by their research to expand their activities. So far, the students have restored a streambank, planted trees, and established a school garden (certified as a "schoolyard habitat" by the National Wildlife Federation) with the assistance of the Philadelphia Earth Force office. They also shared their concerns with the local water company, which plans to build a sewage treatment plant above the reservoir that is their drinking water source. As one student put it, "Who would have thought that there was such life in this area and that our doing something could make a difference?"

Volunteers Dip-In

This summer marks the ninth year of the Great North American Secchi Dip-In. The Dip-In is an international effort in which volunteers produce a "snapshot" of the transparency of water in the United States and Canada. Sponsored by the North American Lake Management Society and the U.S. Environmental Protection Agency, the Dip-In is directed by Kent State University biologists Dr. Robert Carlson and Professor David Waller, and KSU geographer Dr. Jay Lee. The Dip-In provides valuable information about water quality levels and the public's perception of what qualifies as good water quality.

On one day between June 29 and July 14, more than 2,500 volunteers from volunteer monitoring programs in the United States and Canada measured transparency in their favorite lake, reservoir, river, or estuary. Most used an instrument called a "Secchi disk," a flat, horizontal, black and white disk that is lowered from a rope into the water until it disappears. The depth the disk disappears from sight is a measure of the transparency of the water. Transparency is affected by the color of the water and by particles of silt or clay or small plants called algae, and therefore is a measure of some forms of pollution.

The previous Dip-In events have provided valuable information about water quality. This information is available on the Dip-In web site at dipin.kent.edu. The maps made each year have shown considerable regional differences in transparency. Lakes in the northern parts of the United States and in Canada typically have the clearest lakes, while lakes in agricultural regions of the Midwest have some of the lowest transparencies. Transparencies found during past Dip-Ins range from one inch to more than 65 feet. Almost 1,000 bodies of water have been monitored during the Dip-In for five or more years. As the data accumulate, it may be possible to see if the transparency of lakes in the country is changing over time.

Equally valuable has been the information gleaned on the volunteer's perception of water quality. The Dip-In has found that opinions of water quality vary considerably from region to region. A person in Minnesota, Maine, or Canada, for example, may think that a lake is degraded if the transparency is 6 feet, while in other states, a lake with a transparency of only a foot may be considered beautiful. Carlson suggests that these regional differences mean that people become accustomed to the quality that they see every day. Most sobering may be the possibility that everyone grows up thinking that their environment is normal, he notes. Small changes in water quality may go unnoticed. Fortunately, there are volunteer monitors who record these changes in water quality year after year.

The volunteers have also changed our perception of what is considered to be a water quality problem. Typically, those who study lakes think of problems as algal scums and weeds. Although the volunteers think these biological nuisances are important, a group of human-related problems are also being found. Volunteers report that noise, boat congestion, rude boaters, and trash are also important water quality problems. In some states personal watercraft now equal or surpass algae and weeds as the chief perceived water quality problem. The volunteers' perceptions may not reflect the attitudes of all users of our waters, but they do remind us that aesthetics and human interactions are an important part of our environmental consciousness.

[For more information contact the Department of Biological Sciences at Kent State University, Kent, OH 44242. E-mail: dipin@kent.edu; Internet: dipin.kent.edu.]

Volunteers Map Nitrogen Distribution

Stakeholders in the Raccoon River watershed now have another tool in their fight to protect their drinking water quality. In April 1999 the Des Moines Water Works (DMWW) agency initiated a volunteer mapping project to provide an overview of nitrogen distribution in the west central Iowa watershed. The 2.3-million-acre watershed includes 3,600 square miles of prime agricultural land and is home to 113 communities and 60 sewage treatment plants. The river, a primary source of water for DMWW customers, routinely exceeded the drinking water standard for nitrate prior to the project. To comply with the state standard, the DMWW built a large nitrate removal facility.

Nevertheless, the facility was barely adequate during seasonally high nitrate concentrations and high water demand. Gordon Brand, Senior Chemist with the DMWW, notes that, "with no action, further increases in water demand or nitrate concentration would have jeopardized the health and safety of thousands of Iowans."

The DMWW decided to fight the pollution at the source— but first needed to identify where the nitrate was coming from. With an EPA Water Quality Cooperative Agreement grant of \$75,000 and an additional \$3,750 from the DMWW, the group purchased supplies and gathered volunteers. Several state agencies and local organizations cooperated with DMWW to recruit and train volunteers through farm groups, Future Farmers of America and other interested citizens. During an initial training meeting, project staff covered procedures, protocols, and logistics and secured commitment of volunteers for each sample location. The



Collecting samples from a Raccoon River tributary.

volunteers then collected weekly samples from sub-watershed streams on points along the rivers to map nitrate distribution in the entire watershed. They delivered samples to designated drop-off sites having refrigeration facilities where a courier then transported samples to a laboratory for analysis. To keep the volunteers informed of the results, the lab e-mailed each week's results back to the drop-off site coordinators for display the following week.

The strategy of mapping subwatersheds according to nitrate concentrations in the watershed depicted an unequal distribution and provided a basis for focusing water quality improvement efforts in subwatersheds contributing the most nitrogen to surface and ground water in the watershed.

The organization also kept the public informed. Numerous local newspaper articles described the activities of the volunteers and the objectives of the study. Water quality information has been presented at public meetings and summarized in pamphlets. Detailed source water quality information is posted on the DMWW website and can be accessed through the EPA EMPACT website at www.epa.gov/empact. This includes a full report on the volunteer sampling project and a nitrate distribution map of the Raccoon River watershed.

Sampling Results

Results showed that nitrate distribution in the watershed was closely linked to the natural landscape, agricultural practices, and drainage systems. During the high rainfall period from April through July, approximately 30,200 metric tons of nitrogen were transported into the Raccoon River. Most of the nitrate came from the prairie pothole region where the conversion of denitrifying wetlands to nitrogen-intensive row-crop agriculture allowed excess nitrate to flow through ground water conduits to rivers and streams. Nitrate concentrations in the prairie pothole region's tributaries consistently exceeded the water quality standard of 10 mg/L nitrate-N with peak concentrations ranging from 20 to 30 mg/L. However, nitrate concentrations in tributaries of hilly watersheds never exceeded the water quality standard. The hilly region's extensive acres of permanent pasture and cover crops reduced nitrogen loss to ground water and streams.

Addressing the Problem

To help DMWW focus water quality improvement efforts and educate citizens, watershed stakeholders formed a grassroots organization called the Agriculture Clean Water Alliance (ACWA). The ACWA consists of 11 agribusiness retailers and cooperatives. The retailers joined to promote agricultural practices and management tools that effectively use nitrogen resources and reduce loss to rivers and streams. To serve as an example for the rest of the watershed's citizens, the ACWA agreed to adopt and adhere to a policy by which soil conditions, including soil temperature, guided decisions on when to apply nitrogen. And the ACWA continues to sponsor the monitoring program to focus future activities and track water quality changes caused by the implementation of better agricultural practices.

Next Steps

The project initially provided DMWW with a picture of how nitrate is distributed throughout the watershed. Since then, DMWW and ACWA have begun to focus on finding ways to reduce nitrate in targeted areas to provide the greatest improvement in water quality with the limited resources available.

The ACWA is co-sponsoring an in-depth study and demonstration project in the West Buttrick Creek sub-watershed. The project will work with local stakeholders to model source and transport of nitrogen from farm fields to stream and correlate nutrient management activities to nitrate losses. This information will identify effective management strategies and facilitate the development of comprehensive nutrient management plans for farmers in the watershed. DMWW will continue to develop a nitrate distribution database over a wide range of moisture conditions to determine whether changes in nutrient management practices are effective and can be demonstrated and to prioritize candidate watersheds for more intensive monitoring and management.

[For more information, contact Gordon Brand, DMWW, 412 Fleur Drive, Des Moines, IA 50321. Phone: (515) 283-8761; e-mail: Brand@dmww.com; Internet: www.rwvp.org.]

EPA recently announced the release of *Volunteer Wetland Monitoring: An Introduction and Resource Guide*. The booklet, available online at www.epa.gov/owow/wetlands/monitor/volmonitor.html, provides an introduction to people's motivations and methods for monitoring wetlands and includes a multi-page resource guide to other monitoring handbooks and manuals. While it is not a methods manual, the guide offers wetland monitoring program design guidance, most from wetland monitoring program coordinators across the United States.

[For more information, contact Kathleen Kutschenreuter, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, (4502T), Washington, DC 20460. Phone: (202) 566-1383; e-mail: kutschenreuter.kathleen@epa.gov. Copies may be obtained from the Wetlands Helpline at (800) 832-7828 or by contacting the EPA National Service Center for Environmental Publications, P.O. Box 42419, Cincinnati, OH 45242-0419. Phone: (800) 490-9198, fax: (513) 489-8695; e-mail: ncepimal@one.net.]

News from States, Tribes, and Localities

New Mexico Artists: Friends of the Wild Rivers

A New Mexico river conservation group is using art to help restore a local watershed. Founded in 1988, the nonprofit group Amigos Bravos, Spanish for "Friends of the Wild Rivers," holds an annual Paint-a-thon in Taos, New Mexico, to raise funds for protecting wildlife, improving habitat, preventing NPS pollution, and educating citizens. The Paint-a-Thon helps Amigos Bravos achieve its mission of restoring and preserving both the ecological and cultural richness of the Río Grande watershed.

Brian Shields, Executive Director of Amigos Bravos, developed the Paint-a-thon after being inspired by a similar event he saw while visiting a fishing village in Spain. "The Spanish artists were participating in a painting competition to raise funds for social causes. Since so many artists living in the Taos area are also interested in environmental causes, a similar event to sponsor Rio Grande watershed restoration efforts seemed ideal."

Putting the Brush to Canvas

Each year Amigos Bravos invites local artists to donate their time and materials to help protect the Rio Grande at the Paint-a-thon. Amigos Bravos designates a stretch along the Rio Grande as the subject of the art. Most artists set up along the designated stretch, allowing art enthusiasts and the general public to watch them in action. Local sponsors provide free food and beverages to the artists throughout the day. By 4 p.m. the artists hand over their finished products for display in a local gallery until later that evening when Amigos Bravos auctions them off. The funds generated are used to support Amigos Bravos' Rio Grande River projects.

"Despite its name, the Paint-a-thon is not limited to painters," said Shields. "The event is open to all artists. One year we auctioned a poem about the Rio Grande. Last year someone picked reeds by the river and made a hat for the auction. Every year someone comes up with something new." To attract diverse artists and bidders, Amigos Bravos advertises the event through radio, local newspapers and art publications, and the organization's quarterly newsletter. Amigos Bravos also sends out invitations to their members as well as past auction bidders. The artists help spread the word to attract other artists and potential bidders.

Now in its fifth year, the Paint-a-thon continues to expand. Approximately 20 artists participated the first year, compared to almost 70 this year. The proceeds have grown as well; the auction generated slightly more than \$7,000 the first year, compared to more than \$13,000 this year. Although they did not keep records of the number of attendees in previous years, Paint-a-thon leaders note that attendance has increased. "The public has taken a great interest," explained Shields. "This year the art auction drew more than 200 attendees."

Putting the Dollars to Work

Paint-a-thon funds support a variety of projects. For example, Amigos Bravos is working with several government and nonprofit organizations to restore riparian areas along Comanche Creek, a tributary of the Rio Grande. They also work closely with the highway department to reduce herbicide application along roadways by using other less toxic methods of controlling noxious



Artist captures the Rio Grande River on canvas for the Paint-a-thon auction.

weeds. Several new ideas are currently in the testing phase, including one that involves extensive planting of native species and another that places thousands of goats along the roadway to eat the weeds. Other ongoing projects include assembling an oral history of the Río Grande for use in guiding watershed management and restoration, pursuing legal action against a local mining company which allegedly caused ground water contamination from 320 million tons of rock waste, and drafting a plan to recover the Río Grande silvery minnow, which became endangered because its habitat was lost to land development and poor river management.

[For more information contact Brian Shields or Rachel Conn, Amigos Bravos, P.O. Box 238, Taos, NM 87571. Phone: (505) 758-3874; e-mail: bravos@amigosbravos.org; Internet: www.amigosbravos.org.]

Halifax Harbor: Shining Example of a Clean Marina

At the Halifax Harbor Marina in Daytona Beach, Florida, clean boating is simply good business. In the fall of 2000 Halifax Harbormaster George Wakefield hoisted the first Florida Department of Environmental Protection (FDEP) Clean Marina flag on Florida's east coast. Soon after, the Marine Industries Association of Florida honored the marina with its 2001 Green Marina Award. To top it off, Volusia County then proclaimed February 22 to be "Halifax Harbor Clean Marina Day."

The accolades just keep rolling in for this 73-year-old city-owned landmark. *Marina Dock Age*, a leading marina business publication, named Halifax Harbor "Marina of the Year." "Halifax Harbor impressed the judges with its environmental responsibility," says Tinsley Preston, *Marina Dock Age* magazine owner. "The marina has established and maintained productive and mutually beneficial relationships with the county and state governments."



Halifax Harbor Marina in Daytona Beach, Florida

To earn the Clean Marina flag, the marina implemented environmental management, environmental quality, and marina services beginning with Wakefield's arrival in 1994. Wakefield's programs keep the marina's docks clean and safe (i.e., no oil or litter), trash containers well-managed, and drinking water and restrooms clean. Rules and regulations are posted in several visible places for boaters, and well-trained marina personnel are available to answer questions.

He first created a Vessel Pump-out Program that was recognized by the U.S. Fish and Wildlife Service as one of the most outstanding programs of its kind in the Nation. Using a \$50,000 grant from the Florida Clean Vessel Program and the Florida Inland Navigation District, he then installed two new dockside pumping stations. To make the process even easier for boat owners, he fitted a Boston Whaler (a foam-filled unsinkable boat) with a tank and suction hose that goes to the docked boats for waste pump-out. The boat owner does not need to be present for this service, and use of all pump-out stations is free. He also installed a portable toilet waste disposal station at the marina's boat ramp. With this convenient pump-out service, boat owners won't be tempted to discharge waste into the harbor or at sea. In 2000 the marina collected 100,000 gallons of boat wastewater with the pump-out boat and stations.

To prevent fuel spills, absorbent material covers the fueling docks and no-spill containers hang on the boat sides. Sewage disposal is illegal, but grey water is not, though discouraged by Halifax Harbor. The first defense against grey water dumping in the harbor is the presence of 6 bath houses, 35 toilet fixtures, 20 showers, and 14 washing machines. Grey water is reclaimed at the municipal treatment plant and used to irrigate the marina's park. Grassy swales serve as storm water retention areas, allowing water to soak into the ground, leaving no standing water to attract mosquitoes.

Taking the Information to the Community

Wakefield also hosted the first organizational meeting for the FDEP Clean Marina Program, an initiative in which FDEP works with private organizations, typically marinas, to improve the health and cleanliness of Florida's waterways. Halifax Harbor was the first of 38 marinas and 5 boat yards in Florida to earn the FDEP Clean Marina designation. "It is heartening to see the improvement in water quality brought on by the marina's pollution prevention measures," says Wakefield.

“Halifax Harbor has built its reputation on community involvement,” says Carrie Stewart, a long-time boater who is also a member of the Indian River Lagoon Advisory Board and chair of the Halifax/Indian River Task Force. “The marina has been a central part of the environmental community for 14 years,” Stewart says. “These awards show that you can be environmentally aware and meet the needs of the boating community in a good way. Good things do happen when people get together.”

[Parts of this article were excerpted from “Indian River Lagoon Update,” a publication of St. Johns River Water Management District. For more information, contact George Wakefield at (386) 671-3607 or via e-mail at phillipsmarc@ci.daytona-beach.fl.us, or Jan Delaney, Florida Department of Environmental Protection, (850) 488-5757, extension 178, or via e-mail at jan.delaney@dep.state.fl.us.]

Notes on Watershed Management

Storm Water Programs Reach Out to the Public

Storm water management is not a new concept. According to the 1998 National Water Quality Inventory, 11 percent of impaired rivers, 12 percent of impaired lake acres, and 28 percent of impaired estuaries are affected by urban/suburban storm water runoff. To combat the problem, EPA set rules establishing Phase I of the National Pollutant Discharge Elimination System storm water program in 1990 to address storm water runoff from medium and large municipal separate storm sewer systems (MS4s) that serve populations of 100,000 or greater, construction activity disturbing 5 acres of land or greater, and 10 categories of industrial activity.

The Phase II regulations, finalized in 1999, expanded Phase I by adding permit requirements for operators of *small* MS4s in urbanized areas (a residential population of at least 50,000 and an overall population density of 1,000 people per square mile) and operators of *small* construction sites (between 1 and 5 acres). The goal of Phase II is to further reduce impacts to water quality and aquatic habitat by implementing controls on the previously unregulated sources of storm water discharges that could cause water pollution. Operators must design their storm water programs to reduce pollution to the maximum extent practicable, protect water quality, and meet CWA requirements — a tall order, indeed.

Minimum Control Measures for MS4s

- Public Education and Outreach
- Public Participation/ Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-construction Runoff Control
- Pollution Prevention/Good Housekeeping

To do this, municipalities will have to develop and implement best management practices to satisfy each of six minimum control measures (see box). Two of the most important measures require public education and involvement. Educating the public on storm water pollution and specifically the Phase II program will create much needed awareness and involvement. Involving the public during the development of storm water management plans will gain support, increase awareness of storm water runoff and the problems it causes, and help make it easier to adopt and implement the plans once finalized.

Stakeholders Make the Job Easier

The City of Franklin has been struggling with storm water issues for years. Rapid urban growth and development increased impervious surfaces, significantly increasing sediment runoff that ended up in the Harpeth River. In 1999 city leaders began developing a storm water management plan to address these issues. An integral part of their process included the creation of a storm water management task force charged with ensuring that the plan met all six of the minimum control measures for Phase II, while at the same time meeting specific environmental, political, and socioeconomic needs of the city. The task force consisted of residents, business owners, developers, members of environmental organizations, and other stakeholders. The group’s storm water management plan is expected to receive city leader approval this year. This accomplishment helps the group reach their immediate goal while fulfilling the Phase II requirements for public outreach and involvement at the same time.

Other areas of the country have taken a statewide approach to storm water management. With more than 61 percent of the state’s population potentially affected by Phase II, a statewide approach made sense for Pennsylvania. To develop an effective, streamlined statewide Phase II

storm water program, the Pennsylvania Department of Environmental Protection (PA DEP) focused on obtaining public input by conducting outreach and collecting information that could help develop the program.

Through briefings, weekly written updates, e-mail dialogues, and stakeholder meetings, PA DEP made a concerted effort to keep their widely dispersed stakeholder group up-to-date, informed, and in motion. In addition, two brainstorming sessions and outreach meetings held at various locations across the state, educated MS4 operators on the Phase II program and gave PA DEP a better understanding of the challenges facing the operators and what they felt would make an effective storm water program.

Using information gathered from the stakeholders, PA DEP developed a two-option approach to permitting — allowing permittees in the state to comply with Phase II by implementing a pre-approved storm water management program or choosing to design their own program using some (or none) of the components in the pre-approved program. Dedicated stakeholder involvement gave MS4 operators the flexibility to implement what works best for them. In addition, the stakeholders agreed the minimum measure for public outreach and education would be accomplished more effectively through a statewide effort, rather than on a town-by-town basis. PA DEP is now considering developing outreach materials for MS4s to distribute in their local communities.

Education is the Key

Getting the stakeholders involved in the process is important, but it can be an exercise in futility if they do not fully understand the issues they have been asked to address and comment on. That's where storm water education and outreach become a critical part of the process. There are hundreds of existing storm water education programs, but the best programs are the ones that are well planned. Planning consists of defining goals and objectives of the outreach materials or campaign, developing a message, identifying and understanding the target audiences, and formatting and distributing the materials appropriately for the message and the audience.

The City of San Diego's Storm Water Pollution Prevention Program defined its goal as improving the quality of San Diego's recreational waters and reducing beach postings and closures resulting from contamination by 50 percent. To that end, program staff developed a campaign called "Think Blue," a comprehensive educational effort designed to generate awareness and action among residents to prevent storm drain pollution. The Think Blue program produces a kit consisting of an informational brochure and a discount card to be used in conjunction with program sponsors. As one of the corporate sponsors of the program, KGTV Channel 10's weatherman is the campaign spokesperson. The station has supported the campaign through three public service announcements (PSAs). One of the PSAs titled "Think Blue: Roads to Beaches" recently won four Emmy Awards on June 15, 2002. The three PSAs currently air on San Diego area radio and television stations and can be viewed from the Think Blue web site (www.thinkbluesd.org) along with fact sheets, articles, and more.

The method used to convey information can make the difference between what people remember and what they don't. A good example is Sammy Salmon, Storm Water Pollution Expert. Sammy serves as the memorable storm water mascot for the City of Sacramento. Developed by Tom Romano and Lee Pitt of local radio station KFBK, Sammy promotes storm water pollution prevention in a cute and humorous way through radio and television advertisements. The radio spots and audio from the television commercial can be downloaded from the web site at www.sacstormwater.org/what/sammy/sammy.htm. Pinellas County, Florida, also uses a storm water awareness mascot called M. Phibian. This life-size mascot visits local schools and community events to spread the word about storm water runoff.

Local participation increases when the local government is supportive and proactive. The City of Sacramento hosts landscaping and water-related workshops for homeowners, including "Protect Your Local Creeks and Streams — Learn the Basics of Citizen Monitoring" to get residents interested and active in environmental protection. Sacramento also developed a volunteer storm drain stenciling program and a storm water community action grant program to provide a means

for the citizens to become active. And, to educate children and their parents, the city created a storm water pollution prevention display at the Sacramento Zoo and offers classroom presentations for elementary, middle, and high school students.

The City of Durham, North Carolina, is also proactive and supportive of its residents' needs. The city manages a storm water hotline to report illicit discharges. The hotline's promotional refrigerator magnet shows the cartoon character Snidley Whiplash dumping toxic chemicals into a catch basin and a worried fish phoning city storm water staff. Calls to the hotline have increased after each promotion, and the magnets helped make the hotline a major part of the program's success in finding and eliminating sources of pollution.

Adding It All Up

A successful storm water public education and involvement program cannot be developed for free, but it doesn't have to cost a fortune either. According to a 1998 EPA estimate, a program for a town with a population of 100,000 will cost between \$21,000 and \$54,000 for start-up and ongoing expenses. When combined with the costs of the other four minimum control measures, the cost for a comprehensive storm water program quickly gains a price tag ranging from \$139,000 to \$783,000.

Fortunately, costs can be reduced in a number of ways. Working with nearby localities to develop a multijurisdictional storm water education plan will help spread the cost of the program over multiple communities. Educational materials and outreach campaigns very easily lend themselves to meeting the needs of more than one community. Besides substantially reducing implementing costs, working jointly helps ensure that educational messages will be more consistent across watersheds. Municipalities might also present the community with varying levels of service and associated costs to get their input. When evaluating various funding alternatives, municipalities should examine the range of realistic funding options available and design a probable funding mix for their own storm water program.

As communities learn more about storm water issues and the Phase II storm water program, they will naturally become more involved in the process. If municipalities carefully choose outreach materials and public involvement methods, they will be on the road to meeting the requirement for the remaining four minimum control measures for Phase II. Open houses, block parties, speakers' bureaus, web sites, listservers, television and radio PSAs, and stakeholder advisory work groups all help to increase participation in developing locally supported storm water solutions.

[For more information on EPA's Storm Water program, contact Wendy Bell, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, (4203M), Washington, DC 20460. Phone: (202) 564-0746; e-mail: bell.wendy@epa.gov; Internet: cfpub.epa.gov/npdes/stormwater/swphase2.cfm.]

New Program Helps Developers Build Better

Both developers and environmental groups are applauding a new program designed to reduce the environmental impacts of residential and commercial construction in the Chesapeake Bay watershed. Launched in December 2001, Builders for the Bay enables and encourages area watershed developers to voluntarily adopt environmentally friendly site design principles to govern land development and management. Because many existing zoning ordinances and subdivision codes prevent the implementation of this type of environmentally friendly site design, Builders for the Bay is working closely with local stakeholders to identify where changes in local regulations are needed. The program is based on similar successful efforts undertaken in Frederick County, Maryland and in several Virginia communities.

Taking the Program into the Bay Watershed

The program's organizers, the Alliance for the Chesapeake Bay (ACB), Center for Watershed Protection (CWP), and the National Association of Home Builders (NAHB), plan to implement Builders for the Bay in at least 12 jurisdictions in the Bay watershed over the next two years. The ACB, CWP, and NAHB are currently selecting six jurisdictions for program implementation in

the first year. Some areas under consideration are Harford County, Maryland; York and Lancaster Counties, Pennsylvania; and James City County, Virginia. Final selection is anticipated this fall.

To be selected, a potential Builders for the Bay community must meet this certain criteria. First, a local entity must be willing to champion the effort at the local level. "We look for someone, whether a local environmental group or a developer, who steps forward and says 'this would be great for our area'," explains David Bancroft, Director of the ACB. The organizers then work with the local groups to build consensus between interested parties and ensure that adequate local support exists. Finally, the organizers work with the groups to help them raise the \$40,000 to \$50,000 needed to support program implementation in their area. The funds support meeting sites, materials for workshops, and time and travel of the CWP and ACB facilitators. "We prefer that most of the money be raised locally to ensure that the community has a significant investment in the project's success," noted Bancroft. The CWP and ACB have received several grants from various sources to fund their initial selection and implementation efforts.

The 22 site design principles promoted by the Builders for the Bay were originally developed in 1998 by the Center for Watershed Protection as part of its 1998 National Site Planning Roundtable project. The principles show planners, developers, and local officials how changes in development designs can reduce impervious cover, conserve natural areas, and prevent storm water pollution. The principles also serve as a benchmark to help localities identify how existing ordinances need modification to allow this type of development. The site design principles recommend many changes to the typical development design, including:

- Shorter, narrower streets
- Fewer and smaller cul-de-sacs
- Smaller parking lots
- Increased stormwater treatment practices
- More community open space
- Flexible sidewalk standards
- Increased vegetated buffers
- Enhanced native vegetation
- Limited clearing and grading.

The site design principles address three primary areas: residential streets and parking lots (habitat for cars), lot development (habitat for people), and conservation of natural areas (habitat for nature). Each is addressed in greater detail on the CWP web site (www.cwp.org).

After community selection and fundraising, the CWP and ACB host a series of consensus-building workshops. The facilitators teach community representatives about site design principles and help them identify which local codes and ordinances prohibit or impede implementation. Because many local codes and ordinances are so complex, the review process can require multiple meetings and many months to complete. After completion of the review effort, the participants develop a report outlining how well the site design principles could be applied in their locality. The report will identify local building codes that need modification and existing laws and ordinances requiring better enforcement for environmental quality.

Walk the Walk

Although the final report will offer a road map to local environmental resource protection groups, communities will be required to provide adequate financial and human resources to fully implement the recommendations and change codes when necessary. "We hope that the NAHB and its local affiliates will take the lead in changing existing codes that discourage environmentally friendly building practices. Once the codes are changed, the communities must then work to ensure that local developers actually adapt and apply the new site design principles," explained Hye Yeong Kwon with the CWP. Until that happens, the community partners will work to educate and encourage local developers to adopt site design principles permitted by existing codes.

For more information about workshop content and to see an example of a finished report, see *Recommended Model Development Principles for Frederick County, Maryland*, available for download on the CWP web site (www.cwp.org/builders_for_bay.htm) under the heading "Frederick County Consensus Agreement."

[For more information contact David Bancroft, Alliance for the Chesapeake Bay, 6600 York Road, Baltimore, MD 21212. Phone: (410) 377-6270; e-mail: dbancroft@acb-online.org. Also contact Hye Yeong Kwon, Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043. Phone: (410) 461-8323; e-mail: hyk@cwp.org; Internet: www.cwp.org.]

Working to Manage Watersheds Locally

In recent years, many local entities have embraced the watershed approach to manage waters in their jurisdictions. While different watershed approaches may ultimately have different objectives (i.e., protection or restoration), most contain similar core elements resulting in effective implementation. EPA, in consultation with other partners (e.g., U.S. Department of Agriculture),

is currently developing the minimum elements of effective watershed management plans that will help guide local communities through the watershed management process. The process, considered “program neutral,” enables groups to develop a plan independently of identified funding source programs. With a completed plan, the groups work with state and federal agencies to match their needs with available funding programs. This process explores the many facets of watershed management and explains why each is important to a successful watershed management program.

What is Watershed Management?

Watershed management is largely a process of working with people to solve their natural resource and environmental problems while sustaining or improving their individual and community well-being. People must become involved in the process to ensure it meets their needs. Through locally led watershed partnership efforts, government agencies can focus their efforts on working with private and public partners to solve problems rather than run programs. While one can regulate the watershed management process, one cannot effectively regulate local leadership and ownership. Clearly, watershed management requires the willing participation by all stakeholders through a collaborative approach.

Defining the Elements

EPA and its partners have identified the minimum elements that should comprise an effective watershed plan. In general, these elements include:

- **Watershed characterization** — assessment of the natural resource and environmental conditions and an identification of problem sources and areas for treatment using existing data;
- **Planning and prioritization** — goal identification and development of a process for the plan, including an implementation schedule and interim measurable milestones;
- **Coordination and outreach** — identification of implementation mechanisms, including public/private partners, technical and financial resources, and information and education components; and
- **Evaluation** — description of the program’s evaluation for goal attainment including a monitoring component.

A watershed plan following this framework may be designed to achieve any number of goals, including protection or restoration goals, soil conservation or non-aquatic habitat preservation goals, or water quality management goals.

Selecting the Elements

Starting with this framework, entities can build in more specific levels of detail as necessary to achieve their watershed-specific goals. For example, if the local entity plans to implement a total maximum daily load (TMDL), the elements of the watershed plan will need to successfully develop, implement, and track specific progress for achieving the load and wasteload allocations in the TMDL. Additional elements could include, for example, identification of approved load and wasteload allocations in the TMDL, specific schedules for permit issuance or re-issuance, and nonpoint source management measures that will be needed to achieve the load allocations.

While the components and objectives of each watershed plan may vary, there is considerable overlap in the overall watershed planning framework. These commonalities are identified in the broader set of elements outlined above. By adopting this watershed framework, watershed activities will be more readily adaptable to other activities occurring in the same watershed. This provides an increased opportunity for leveraging funding and resources and for coordinating activities effectively.

Making it Work

Stakeholder participation is crucial. Building a consensus of stakeholders will provide a foundation to support behavioral change within the watershed. People living, working, and owning land in the watershed must make the right short- and long-term decisions to protect and restore water quality. The challenge is to balance the short-term demands for day-to-day economics with long-term

sustainability of a quality environment. In most situations this will require changing stakeholders' perceptions and behavior. Social capacity building efforts consist of outreach, education, and information efforts. If successful, they move stakeholders through various stages of awareness, knowledge, understanding, ability, and desire to become active. They also provide support to ensure a sustained behavioral change. The type of effort and expected response vary during different stages of implementation.

Adaptive management is a key requirement for the process to work. Adaptive management allows adjustments in the management direction as new information becomes available. The combination of natural variability in the hydrologic cycle and the uncertainty associated with the off-site impact of pollution controls (both point and nonpoint) requires that watershed managers be flexible enough to modify implementation approaches based on progress and available information.

Combinations of watershed characteristics, sources of pollutants, and management approaches are unique, and therefore, management efforts may not proceed exactly as planned. Adaptive management does not mean that the watershed's water quality goals would be modified based upon lack of progress, but that the results would be used to modify management policies, strategies, practices, and operation and maintenance procedures to reach goals.

New Watershed Project Management Guide

The recently released *Watershed Project Management Guide* by Thomas E. Davenport presents a four-phase approach to watershed management based on a collaborative process that responds to common needs and goals. The recommended process consists of a series of four basic phases: Assessment, Planning, Implementation, and Evaluation. The four-phase approach helps watershed practitioners develop a plan consistent with the recently released USDA-EPA Watershed Management Planning and Implementation Process guidance. The process can be used to implement a management strategy to meet load allocations required by an approved TMDL, goals of a source water protection plan, USDA programs (i.e., Environmental Quality Incentive Program), or section 319 projects. To order, visit the website www.crcpress.com or call (800) 272-7737.

Conducting an effective monitoring and assessment effort is another key element in planning, implementing, and adapting management practices. Monitoring and assessment efforts enable local partnerships to possess credible data and information to make sound decisions, measure progress toward meeting conservation and environmental goals, and provide crucial information for guiding decisions through the adaptive management cycle. Monitoring and assessment before and during the project identifies baseline conditions and the likelihood of goal attainment. If the results show a potential problem, mid-course adjustments in the management approach can be made.

Work in Progress

EPA welcomes comments and recommendations on the general elements of effective watershed management planning via e-mail to Stacie Craddock, U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, at craddock.stacie@epa.gov.

Agricultural Notes

Creating the Monterey Bay Farmers' Clean Water Initiative

In northern California a community is coming together to protect Monterey Bay. Agricultural organizations and local watershed stakeholders are leading a two-year pilot project called the Pajaro Valley Project which is striving to protect the Bay's water quality while maintaining the region's economic viability. The pilot project is the first step in the development of a much larger, watershed-wide program that will one day be known as the Monterey Bay Farmers' Clean Water Initiative.

The Pajaro Valley Pilot Project is an incentive-based program for agricultural producers in the large Pajaro River watershed, which encompasses four counties and makes up nearly one-sixth of the Monterey Bay watershed. The project's stakeholders — agricultural producers and concerned citizens — hope that the project will demonstrate that those depending on the agricultural and urban area surrounding the Bay (1) can benefit from environmental stewardship, and (2) conduct a successful program.

The agricultural producers are encouraged to highlight their regional identity and implement environmentally sensitive management practices to provide better marketing opportunities and

improve relations between regulators and environmental groups. Stakeholders identified and described a set of management practices they believe to be the soundest method for successful farming and environmental stewardship for the region. Project staff work with the participating producers to develop a sustainable program for area farmers.

How Did it Begin?

A Technical Advisory Committee (TAC) was formed by the stakeholders and is comprised of farmers, regulators, representatives of the agricultural and environmental management interests, and community organizations. Two nonprofit agencies, AG Innovations Network and Community Alliance with Family Farmers, manage and staff the program, and the California State Water Resources Control Board funds it. Project staff help landowners and farmers develop and implement water quality plans using approved water quality protection and management practices. The staff is also working to build institutional and permanent funding support from state and local agencies and private sources to ensure the pilot project will expand throughout the watershed.

Staff also market the Fields to Oceans label, a compelling promotional message for participating farmers to use throughout the Bay watershed. A unique mark of excellence in environmental stewardship, the Fields to Oceans label, shows the farmer's desire to protect the Monterey Bay. When project staff determine a farmer has reached the program's management goals, the farmer is encouraged to post the label in his fields and use it on product packaging. Once on products, the label encourages consumers to play a part in the protection of the Bay by purchasing environmentally protective items. The goods are sold as superior products with minimum environmental risk as a result of the environmental and health conscious practices used in product development and production. The farmer benefits from the increased sales of the environmentally-protective product.

What Do the Farmers Do?

Optimum water quality protection practices identified by the stakeholders are outlined in a water quality protection practices manual provided by the project staff and TAC. Practices include management initiatives that should be adopted by producers to control the sediment, nutrients, and pesticides, along with irrigation management practices to manage the water supply to the crops. The manual is divided into four sections based on the farmer's progress throughout the two-year program.

The first section includes a beneficial rating system with questions and answers that address water quality management practices. The manual's second section provides background educational materials, giving the reader more information about the topics addressed during the question and answer section. The third section provides summary and evaluation sheets that farmers can use to record their scores from the question and answer section. The fourth section describes the program certification process for the farm.

The farmer begins by reading the detailed descriptions in the beneficial rating system and then rates the practices on the farm from one to four (four being the best). To develop an implementation plan, the farmer then answers several questions to determine the most appropriate practices for his or her farm. Separate scores generated for each of the four management sections (sediment, nutrients, pesticides, and irrigation) are recorded on summary sheets. The scores from each management section are added and divided by the number of issues, yielding a grade point average (GPA) for each section. The TAC is responsible for working with the farmers to help them achieve an acceptable GPA for each management section. With acceptable GPAs in each section, the farmer's program will be approved, thereby allowing the farmer to use the Fields to Ocean label.

What Happens Next?

Last summer, initial enrollees completed the self-assessment outlined in the water quality protection practices manual. The group's next step is to implement additional practices that will help each reach the desired GPA. The regional promotional strategy to provide incentives for both production and consumer action will be an ongoing effort. As the project staff and TAC develop



Farmers enrolled in the pilot project can use this label when packaging their goods. Consumers can take pride in knowing their purchases were produced with environmentally sound practices.

and implement the goals set forth in the pilot project, the farmers currently participating will be their best source of information and experience. The success of the current project will eventually serve as the foundation for the Monterey Bay Farmers' Clean Water Initiative.

[For more information contact Michael Dimock, Community Alliance with Family Farmers, 1055 West College Avenue, #136, Santa Rosa, CA 95401. Phone: (707) 528-2222; Internet: www.pvpilot.org]

Nutrient Trading Tools for Cleaner Water

Around the country local watersheds are developing water quality trading programs for pollutant control. EPA supports these programs on the basis that water quality goals can be achieved more efficiently and cost-effectively while providing other benefits. The primary focus of water quality trading is on sediment and nutrients, though other pollutants should not be ruled out. In May 2002 EPA proposed a new trading policy covering water quality trading in unimpaired waters, in impaired waters prior to Total Maximum Daily Load (TMDL) development, and in waters with an established TMDL. Many nutrient trading programs and assistance groups have formed to curb nutrient runoff from agricultural operations.

Trading Means Sharing the Load

Nutrient trading is a market-based approach of transferring nutrient reduction credits between buyers and sellers. For example, an industrial plant releasing an overabundance of phosphorus into the local waterways and a farmer working to control the phosphorus runoff from his dairy operation could trade nutrient reduction credits. The plant would purchase reduction credits from the farmer when it could not cover the cost of reducing nutrient loading, and the farmer could implement new management measures to continue reducing phosphorus on his property with the additional funding.

While some elements of trading strategies are the same nationwide, it is difficult to develop a blanket strategy as the mixed-use watersheds in the United States vary greatly in size and pollutant discharges. Also, trades cannot be made simply to rid an entity of responsibility for a pollutant, as each trade must be a cost-effective way of reaching a water quality goal or even allowing for better water quality production. Nutrient trading also spotlights specific NPS pollution issues for stakeholders as trading relationships develop. In a watershed, where a few entities want to buy reduction credits and others want to sell, buyers and sellers may pair up to focus on specific pollutants to be controlled and thus create a positive financial gain for all parties.

Getting the Word Out on Nutrient Trading

Since the idea of nutrient trading was posed in the mid-1990s, projects have developed with state funding throughout the United States. Pilot projects help stakeholders gain a better understanding of the terms and conditions that may be placed on nutrient trading. Lessons learned from the pilot projects allow for investigation of barriers erected by current policy and regulations, as well as development of a general comprehension of the willingness of farmers and industries to develop trading partnerships.

The Great Lakes Trading Network (GLTN), an organization dedicated to the development of market-based incentive programs, has become a national clearinghouse and forum for trading projects and partnerships. Members of the network representing a wide variety of projects across the country actively participate in the forum.

GLTN's goals include:

- Obtain, generate, evaluate, and disseminate information on trading programs;
- Support regional and watershed-based trading initiatives;
- Increase public awareness and support for trading; and
- Facilitate implementation of programs established by state and federal environmental regulations.

The GLTN meets its goals through regular conference calls, presentations, an interactive website, and collaborations with other agencies, institutions, and organizations.

Trading Partnerships

Over the last two years, the World Resources Institute has developed NutrientNet (www.nutrientnet.org), a primer for the agricultural, economic, and environmental influences on the development of trading partnerships in a given watershed. NutrientNet encourages nitrogen trading, recommends water quality improvements, and works to improve water quality in watersheds with existing trading partnerships. NutrientNet serves many of the necessary programs that must be developed before nutrient trading is generally accepted by stakeholders in a watershed. The web site offers tools for those developing partnerships that

- estimate the effectiveness of potential trades,
- provide cost-effective ways to do potential trades,
- allow potential traders to be identified,
- act as a central location that lists loads and types of trades, and
- increase the transparency of the trading process.

Worksheets are posted on the web site for potential buyers and sellers to conduct economic studies for a potential trading program. The conclusions outline many factors that must be considered in developing a successful trade, including costs of the transaction to both buyer and seller, dependability of NPS load reduction activities, and the general public's acceptance of trading. A major hurdle is the creation of a recording clearinghouse that would allow all credits to be developed in the same manner. It is also necessary to keep records so that stakeholders can identify where trading partnerships have formed.

NutrientNet simplifies initiating and developing trading partnerships. The web site provides worksheets for farmers and point source entities to describe credits available for sale or purchase. The farmer identifies available options for nutrient load reduction by studying the cost of runoff reduction and cost of the credits and then calculating the number of credits that are available to sell. The farmer can list credits and location information on the web site and complete the trade when a point source discharger with complementary needs is located within the same watershed. The web site also records and stores this information in a database.

Nutrient trading can economically benefit multiple polluters in a watershed while simultaneously protecting and improving water quality for the future. Trading also fosters relationships between the people who use the watershed for various reasons. With EPA's new TMDL trading policy and the move toward public acceptance, nutrient trading will become an important part of the future of watershed protection.

[For more information, contact Patricia Zurita, World Resources Institute, 10 G Street, NE, Washington, DC 20002. Phone: (202) 729-7673; e-mail: pzurita@wri.org.]

Rice Farmers Hold Winter Water on Fields for Triple Win

Rice farmers are solving the problem of soil erosion by holding water on their fields all winter. James MacLellan, Mississippi Department of Environmental Quality and project manager for the demonstration project, says, "In the past, farmers used to till their fields after harvest and leave them bare all winter. With all the rain we get in the winter and spring, that translated into a lot of soil erosion." Water ran off the fields, eroding soil and depositing sediment in the ditches and streams. A dike/road system makes each field a shallow pond when it rains, keeping the water on the fields. MacLellan explains, "Many of the farmers have gone to precision land leveling with a dike/road around the field. The land is leveled until it has very little grade. This assists the farming, but it also means the fields would become shallow ponds without a drain outlet (we have a lot of clay soils)."

To regulate the field water, farmers install a pipe and riser system to hold the appropriate amount of water and drain it during planting or harvest. The pipe, similar to a 55-gallon drum cut in half lengthwise, stands on one end at the side of a dike. A drain pipe in the bottom carries water from the drum through the dike to a ditch outside. To keep water on the field, the open side of the drum is fitted with risers (boards) inserted into slots at the side of the drum. In the spring, a month

In the center is a pipe in a flooded rice field. One of the boards is propped against the back of the pipe.



Here is a head-on view of a pipe against the dike around a rice field. No boards are in view.



or so before planting, the farmers remove the boards and drain the fields. By controlling water releases, sediment loading from erosion from the ditches and along stream banks decreases.

To help farmers purchase and maintain the system, Ducks Unlimited partnered with several funding agencies to form the Mississippi Partners Winter Water Management Project. With a section 319 grant of \$500,000 from EPA, \$186,000 from the Mississippi Department of Environmental Quality, and \$200,000 from Ducks Unlimited, the Project funded almost 100 pipes with water control structures for farmers over the past year. These pipes have been installed in agricultural grounds to hold winter water and improve water quality in the Bogue Phalia and Coldwater River Watersheds.

Tom Willis, Mississippi Project Biologist for Ducks Unlimited, completed the first of a 3-year paired study of sediment held on the fields through this practice. "This practice reduces sediments significantly. This has a good impact on water quality and creates more winter water fowl habitat," said Willis. From December 2001 to February 2002, Willis collected runoff water samples from paired fields (pipe versus no pipe) and sent the samples to Mississippi State University for sediment analysis. The first year data indicated a 95 percent reduction in sediment loss in fields with water control structures in December, a 35 percent reduction in January, and a 42 percent reduction in February when compared to those without structures. These reductions encouraged other farmers to participate.

MacLellan noted, "The demonstration project is strictly voluntary, but the practice may help the region meet its Total Maximum Daily Load requirement. Farmers do it because this is a way to share the cost of the pipe rather than them having to pay for everything out of their own pocket. When you talk about a farmer having 1,000 acres and needing to put in 5 or 15 or more pipes at \$250-\$500 a pipe, it adds up."

Winter Water Testimonials

Mississippi farmer Charlie Heinsz saves time, money, and topsoil by holding winter rain on his rice fields. In addition, the temporary wetland attracts ducks for him to hunt. He hails from five generations of rice farmers in Mississippi and, originally, Louisiana. His grandfather installed pipes and risers to control water, but the cost began to become an impediment. With the help of Ducks Unlimited, he now levels more fields and installs pipes every year. "Any time I can stop erosion and save work, it just makes sense," notes Heinsz. "The water covers the straw after harvest and prevents weeds from growing. In the spring, the straw has disappeared and I do not have to work the fields before planting again."

Another Mississippi rice farmer, Hugh Campbell, says, "The pipes and risers make all the difference in the world. The biggest plum is the erosion factor. With the pipes and risers, the soil and the chemicals stay in the field. Previously, the fields drained directly into the ditches, the silt built up, and the ditches had to be cleaned out."

[For more information, contact James MacLellan, Mississippi State Department of Environmental Quality, P.O. Box 10385, Jackson, MS 39289. Phone: (601) 961-5061; e-mail: James_MacLellan@deq.state.ms.us. Also contact Tom Willis, Ducks Unlimited, 2001 South Commerce Street, Suite G, Grenada, MS 38901. Phone: (662) 226-6880; e-mail: twillis@ducks.org.]

Technical Notes

Observations on Technical Achievability in TMDL Development

By Bruce Cleland, America's Clean Water Foundation

A strength of the total maximum daily load (TMDL) program is its ability to support development of information-based water quality management strategies. If done properly, a TMDL can inform, empower, and energize citizens, local communities, and states to improve water quality at the local watershed level. The basic information derived from a sound TMDL can liberate the creative

energies of those most likely to benefit from reduced pollutant loadings to their own waters (*Tracy Mehan, November 2001*). With this in mind, tools are needed that promote effective communication between TMDL developers and those responsible for implementing actions that will lead to measurable water quality improvements. The TMDL process raises many issues such as reasonable assurance, trading, and adaptive management, in which technical considerations intersect with policy issues. As a result, technical achievability of pollution control practices has received an increasing amount of attention over the past several years. With the large number of TMDLs that must be completed, limited resources, and the complex, interrelated nature of water programs, the “two Ps” are critical to success: practical approaches and partnerships.

Two issues that often confront TMDL developers include methods to assess technical achievability and the level of precision needed to develop load reduction estimates. Watershed analysis uses a bottom-up approach towards TMDL development as one way to establish a meaningful, value-added framework that links water quality concerns with proposed solutions. TMDL development using a bottom-up approach takes advantage of networks of programs and authorities across jurisdictional lines. Information on management measures related to both source control and delivery reduction methods can be incorporated into the allocation part of TMDL development. An important key to the success of the TMDL program is building on linkages to other programs, such as nonpoint source management. Many successful efforts to develop TMDLs have, for example, involved the section 319 program.

Basing a TMDL on an Achievability Analysis

An example from the Pacific Northwest illustrates one way in which technical achievability was considered in TMDL development. Specifically, the Simpson Northwest Timberlands TMDL established by the State of Washington was developed using an achievability analysis. The Simpson TMDL is intended to address fisheries concerns for several waters located on land owned by Simpson Timber Company. The TMDL is designed to address water quality impairments caused by surface water temperature increases from excessive heat and sediment, which were reducing the quality of rearing habitat for coho salmon and steelhead trout.

The first step for developing TMDLs, under the current regulatory framework, is identification of a loading capacity (i.e., the greatest amount of pollutant loading that a water can receive without violating water quality standards). The loading capacity provides a measure to determine the amount of pollutant reduction needed to bring a water into compliance with water quality standards. Within the Simpson TMDL, the loading capacity for heat (or solar radiation) is based on shade levels in the riparian corridor needed to meet water quality standards for temperature. Similarly, the Simpson TMDL based the loading capacity for sediment on the volume delivered to stream systems through various erosion processes.

Once a loading capacity has been identified, allocations are assigned to contributing sources. The Simpson TMDL derived allocations using effective shade and sediment delivery targets. These targets were based on an analysis of expected results from implementing an array of management measures (e.g., riparian conservation strategies, improved road management, unstable slope protection, and a wetlands conservation program) that were needed to address processes that influence water temperature. Effective shade allocations were based on achievability estimates using information about each channel class (e.g., drainage area, active channel width, range of flows, etc.), combined with characteristics of mature riparian vegetation (i.e., vegetative density and height) and buffer widths. This approach leads to shade targets that recognize the variability in channel and riparian characteristics that occur across the landscape. Similarly, sediment delivery allocations were based on estimates of the percent of the load that could be controlled through implementation of various management practices. Thus, the measures were linked to specific source areas and to appropriate actions needed to solve identified water quality problems. This bottom-up approach gives major consideration to the actions that can be implemented. Any gaps can then be readily identified and filled.

Tools for Assessing Technical Achievability

Traditional approaches toward TMDL development tend to focus on targeting a single value, which typically depends on a water quality criterion and some design flow. The single number concept does not work well when dealing with impairments caused by nonpoint source pollutant inputs. One of the more important concerns regarding nonpoint sources is variability in stream flows, which cause different loading mechanisms to dominate under different flow regimes. Because of the wide range of variability that can occur in stream flows, hydrologists have long been interested in knowing the percentage of days in a year when given flows occur. Generally, the percentage of time during which specified flows are equaled or exceeded may be compiled in the form of a flow duration curve. This is a cumulative frequency curve of flow quantities without regard to chronology of occurrence (Leopold, 1994). Duration curves may express daily, weekly, or monthly average flows. The most common form of the flow duration curve is the percentage of days in a year the mean daily flow is equaled or exceeded.

Because nonpoint source pollution is often driven by runoff events, TMDL development should consider factors that ensure adequate water quality across a range of flow conditions. In keeping with this idea, Kansas derived a simple TMDL development method based on duration curves, which avoids constraints associated with using a single flow number. Kansas has been using load duration curves for the past several years as a key part of the TMDL development process. The initial focus in Kansas was to provide a way to identify whether point or nonpoint sources are the major contributors to water quality problems. The expanded use of flow duration curves has since demonstrated its utility as a targeting tool. In particular, load duration curves can add value to the TMDL process by identifying targeted participants (e.g., NPDES permittees) at critical flow conditions, targeted programs (e.g., Conservation Reserve Program), targeted activities (e.g., conservation tillage or contour farming), and targeted areas (e.g., bank stabilization projects).

Flow duration curve analysis identifies intervals, which can be used as a general indicator of hydrologic condition (i.e., wet versus dry, and to what degree). This indicator can help point problem solution discussions towards relevant watershed processes, important contributing areas, and key delivery mechanisms. These are all important considerations when identifying those controls that might be most appropriate and under what conditions. In addition, duration curves also provide a context for evaluating both monitoring data and modeling information. This offers another way to look at identifying data needs where adaptive management is being considered or utilized.

A simple way to illustrate the use of load duration curves in an achievability analysis could start with the evaluation of point source contributions in a watershed, much like Kansas did in their initial work. These are relatively continuous discharges that do not exhibit the wide range of flow variation observed with nonpoint source inputs. A logical next step that extends the achievability analysis to nonpoint sources could focus on those contributing areas most likely to deliver storm water generated during low flow conditions, such as riparian zones. The analysis might consider, for example, a range of buffer widths that could be applied to different channel types in the watershed. Similarly, extending the analysis to consider other potential nonpoint source inputs could focus on expected load reduction estimates that might be achieved using best management practices appropriate to the source area and delivery mechanism of concern. One example might estimate expected load reductions to be achieved using grassed waterways or conservation tillage. The resulting TMDL would be the aggregate analysis of practices considered for implementation in the watershed plan.

Adaptive Management

Adaptive management plays a key role in the implementation process for achieving load reductions. Using a value-added bottom-up approach, TMDL development uses the best available data. Progress towards achieving load allocations are periodically assessed through phased implementation using measurable milestones. Under adaptive management, a watershed plan should not be delayed because of a lack of data and information for the “perfect solution.” The process should use an iterative approach that continues while better data are collected, results analyzed, and the watershed plan enhanced, as appropriate. Thus, implementation can focus on a cumulative reduction in loadings

under a plan that is flexible enough to allow for refinement, which better reflects the current state of knowledge about the system and incorporates new and innovative techniques.

[For more information, contact Bruce Cleland, America's Clean Water Foundation, 25919-99th Avenue, S.W., Vashon, WA 98070. Phone: (206) 463-2596; e-mail: b.cleland@acwf.org. Kansas contacts: Hank Ernst, Kansas Water Office. Phone: (785) 296-0866; e-mail: hernst@kwo.state.ks.us; and Don Sneathen, Kansas Department of Health and Environment. E-mail: dsneathen@kdhe.state.ks.us.]

Sediment Sampling Instrumentation Now Available to the Public

Sediment sampling instrumentation, available for many years solely to federal agencies, can now be purchased by the public, thanks to the EPA Headquarters Watershed Branch, which worked with the Federal Interagency Sediment Project Committee. The instruments development and distributed by the Federal Interagency Sedimentation Project (FISP) are intended to give precise and accurate readings of

the transport and deposition of sediments for use in a variety of applications where assessment of sedimentation conditions in surface waters is necessary.

A cooperative agreement has been completed between four companies and the FISP that allows these companies to act as authorized commercial distributors of FISP-produced and tested samplers and associated equipment. FISP will continue

to sell FISP equipment directly to all federal agencies and the four distributors will sell FISP equipment to state and local government agencies, international government agencies, universities, private organizations and companies, and individuals.

[For contact information about these companies, visit fisp.wes.army.mil.]

Notes on Education

Washington State Features Exceptional Environmental Education Resources

Looking for examples of great nonpoint source pollution education resources? Washington State Department of Ecology (Ecology) recently developed a web site to help Pacific Northwest educators find and access exceptional resources from across the region. Called the *Showcase of Exceptional Environmental Education Products*, and located at www.ecy.wa.gov/forms/showcase, the site uses an online searchable database to help connect users with the information resources they need.

Why Create the Database?

"For years we have been funding the development of products, like brochures and curricula, that were intended to serve as models for others to emulate but never got promoted as such. Other people's products, some of them really original and outstanding, came to our attention. However, we didn't have any way to easily communicate this information to the public. We developed Showcase to make the best ones we found available," explained Annie Phillips with Ecology.

Showcase offers information about diverse resources, including CDROMs, web sites, booklets, pamphlets, brochures, videos, guidance documents, and entire campaigns and programs related to NPS pollution. Users may search for resources by category (i.e., household practices, industry-specific guidelines, etc.) or format (i.e., CDROMs, videos, etc.). The web site provides detailed information about each resource, including a description, author, production date, the intended audience, a web link, and how to obtain a copy.

Any materials applicable to nonpoint problems in the Pacific Northwest may be submitted to Ecology for consideration. Nomination forms are available online. Once they receive the information, Ecology staff will rate the product based on the following four criteria:

- **Execution:** How clear and accurate is the message? How attractive and eye-catching is the design? Is it too long/short?
- **Effectiveness:** Does the product influence the target audience and/or raise awareness?
- **Relevance:** Is the product relevant to the target audience's interests, lifestyles, and prior knowledge?
- **Adaptability:** Can it be easily altered to apply to different regions or purposes?

Each criterion will be assigned between 1 and 5 water drops, with 5 being the best. Only those products that receive an average of at least four drops in all four criteria will be included on the

web site. Ecology staff reviewed more than 120 products, of which 84 have met the criteria for listing on the web site.

"Showcase provides people with easy access to good publications that they may either use directly or model their own materials after," said Phillips. "Why spend the time and effort developing something from scratch when so many great examples are already available?" As more people learn about the site, Ecology staff anticipates an increase in the number and type of resources featured in the Showcase.

[For more information contact Annie Phillips, WA State Department of Ecology, PO Box 47600, Olympia 98504-7600. Phone: (360) 407-6408; E-mail: aphi461@ecy.wa.gov.]

Sharon and Beginning Readers Search for the Environment

"Sharon, a young girl, sets out on a quest to find the environment, which her teacher, Miss Clark, says people need to keep clean. Herman, a squirrel who seems to know more than he's telling, helps Sharon look."

Sharon is the main character in a new read-along children's book published by the National Institute of Environmental Health Sciences (NIEHS), an arm of the National Institutes of Health in Research Triangle Park, North Carolina.

Although the printed version of *Sharon Finds the Environment* is hot off the presses, Sharon has been tested and praised

by young readers on the NIEHS Kids' Page (www.niehs.nih.gov/kids/home.htm) for over a year. In fact, there is a second Sharon story also on the web, *Sharon Cleans Up*, along with additional stories, games, music, and more.

[Copies of *Sharon Finds the Environment* are available at no cost for single copies or in limited quantities by contacting Sharon Book at NIEHS, P.O. Box 12233, Research Triangle Park, NC 27709. Phone: (919) 541-3345; e-mail: booklet@niehs.nih.gov.]

Be Prepared to Restore!

Riparian restoration is more than volunteer work for some Maryland Boy Scouts. The Scouts help local nonprofit and government organizations implement riparian restoration projects in the Tiber-Hudson River watershed located in northern Howard County. Unlike a typical restoration project, however, these Scouts do more than just help plant trees and shrubs. They do it all: plan the project layouts, identify and solicit funding sources, drum up volunteer support, plant, and maintain the restoration project. Why? Many local Scouts choose to restore riparian buffers as part of their Eagle Scout projects in exchange for a choice of project sites and guidance from the local organizations on riparian restoration and grant writing. All parties benefit. The Scouts gain additional responsibility while local organizations attain environmental improvement with minimal financial investment.

How it All Began

The Tiber-Hudson Watershed Partnership (THWP), the environmental arm of the nonprofit, volunteer-driven Ellicott City Restoration Foundation, developed the Helping Our Wild Neighbors (HOWN) program in the mid-1990s. The Boy Scout project serves as a key program within

HOWN. "Our suburban residential county lacks understory vegetation. If you look around, all you see is lawn after lawn after lawn," explained Cindy Hirshberg, THWP Chair. "Even the vegetation in rights-of-way under utility lines was maintained by mowing. In cases where the rights-of-way transected the Tiber-Hudson River the corridor was often mown almost all the way to the river bank. Erosion and flooding is a problem. We initiated HOWN to begin restoring the stream buffers between the grassy meadows in the powerline right-of-way and the river, with the ultimate goal of increasing wildlife habitat and capturing nonpoint source pollutants." Baltimore Gas and Electric, the local electric utility (currently owned by Constellation Energy), gave THWP permission to restore understory and riparian areas located on the utility's rights-of way.

THWP wanted to develop the HOWN program so it could also serve as an educational tool for local children and their parents. When a Scout group asked THWP if some of the Scouts could develop Eagle Scout projects in support of the



Boy Scout Troop members pause from their restoration work.



HOWN Scout Badge

HOWN program, a perfect partnership was born. THWP applied for and received a \$16,000 EPA environmental justice grant to support development of the THWP/Scout partnership, creation of the Eagle Scout project, and development of the HOWN Scout badge. Using the funds, THWP arranged for the nonprofit Center for Watershed Protection (CWP), also located in Ellicott City, to educate Scout troop leaders about watershed science and provide the educational resources to prepare Scouts for stream buffer restoration projects.

First, CWP held educational sessions for the Scout troops to explain the importance of healthy watersheds. They explained the process and purpose of riparian restoration and emphasized that restoration is only one important tool in an overall watershed protection strategy. Jennifer Zielinsky, Watershed Engineer at CWP and HOWN instructor, notes that "although not all Scouts were planning to develop restoration-related Eagle Scout projects, each session attendee learned valuable information." To further prepare Eagle Scout candidates and their Scout leaders, THWP held several grant-writing sessions that taught young scouts and their leaders how to identify, apply for, and manage grants. The CWP also gave THWP and Scout leaders copies of the presentations on CDROM so the information could be shared with future Eagle Scout candidates and new Scout leaders.

Applying What They've Learned

The Scouts, now armed with resources, could proceed. According to Scout leader John Esworthy, five Scouts have currently completed their Eagle Scout projects and approximately 20 more are either in the planning/implementation phase or have expressed intentions to initiate a project. Some of the projects are straight riparian restoration where the Scouts choose a site, plan the project, find funding, and order the plants, assemble volunteers, and implement the project. The Scouts must also monitor and maintain the project to ensure the native plants remain healthy. These projects are typically large: the Eagle Scout candidate plants between 50 and 100 trees and shrubs and creates a buffer at least 75 feet wide on each river bank.

Eagle Scout candidates learn to take the initiative and find the resources needed to support their projects. Since most projects require extensive planting, the Eagle Scout Candidates typically recruit members of their troop to help. In return for assistance, each troop member earns credit towards merit badge components encompassed in the HOWN badge, such as wildlife, forestry, and water quality. Each component earns its own arc-shaped badge that fits around the outer edge of the HOWN badge.

The Future

The program continues to expand. Currently, Scouts are planting only at two utility right-of-way sites in the Patapsco River watershed located in the northern portion of the county. With the cooperation of the Howard County Department of Public Works, the project will soon host planting sites on public land in the Patuxent River watershed located in the southern portion of the county. Both rivers are important freshwater tributaries of the Chesapeake Bay.

[For more information, contact the Tiber-Hudson Watershed Partnership, Ellicott City Restoration Foundation, P.O. Box 92, Ellicott City, MD 21041. Phone: (410) 480-0822; e-mail: ECRFPres@aol.com.]

Reviews and Announcements

National Coastal Condition Report

The *National Coastal Condition Report*, available online at www.epa.gov/owow/oceans/nccr/index.html, describes the ecological and environmental conditions in American coastal waters. This report, first of its kind, presents a broad baseline picture of the overall condition of United States waters as fair to poor and varying from region to region. The Report will serve as a useful benchmark for measuring progress in coastal programs in the future. In subsequent years, additional publications examining specialized coastal issues and measuring condition changes over time will be developed.

The report represents a coordinated effort between EPA, National Oceanic and Atmospheric Administration, U.S. Geological Survey, and U.S. Fish and Wildlife Service. It summarizes the condition of ecological resources in the estuaries of the United States and highlights several exemplary federal, state, tribal, and local programs that assess coastal ecological and water quality conditions.

Download the National Coastal Condition Report at www.epa.gov/owow/oceans/nccr/index.html or for hard copies, contact the EPA NSCEP by mail at P.O. Box 42419, Cincinnati, Ohio 45242-0419. Phone: (800) 490-9198; e-mail: ncepimal@one.net (reference publication number EPA 620/R-01/005). For more information on EPA's coastal program, contact Barry Burgan at (202) 566-1242 or Kevin Summers at (850) 934-9244.

Terrene Institute Releases New Puzzle

A new watershed management puzzle is available from Terrene! Taken from another popular poster, *Watershed Management: A Community Process*, Terrene's second puzzle offers another fun way of learning about watershed management. Buy puzzles for only \$14 each and a companion poster for \$5. If you buy by the case (24 puzzles), you will save 30%. To order, visit www.terrene.org, or call (703) 548-5473.

Onsite Wastewater Treatment Systems Manual Released

The new *Onsite Wastewater Treatment Systems Manual* (OWTS) is now available at www.epa.gov/ORD/NRMRL/Pubs/625R00008/625R00008.htm. The new manual complements the 1980 *Design Manual for Onsite Wastewater Treatment and Disposal Systems* (EPA 625/180-012), which served as a standard reference for onsite/decentralized program managers, designers, installers, and others involved in the management and design of these systems for years. EPA Offices of Water and Research and Development co-chaired the current revision over the last five years. A wide variety of experts in the onsite field contributed ideas and provided technical comments throughout the process.

The manual provides the latest information on onsite system management, siting, design, installation, maintenance, monitoring, and replacement. It will help users assess and select the most suitable sets of technologies and techniques appropriate for site specific conditions. It also promotes use of an integrated risk/performance-based approach to design and includes information on cost and effectiveness.

[For more information, contact Rod Frederick, U.S. Environmental Protection Agency, Nonpoint Source Control Branch, 1200 Pennsylvania Avenue, NW, (4503T), Washington, DC 20460. Phone: (202) 566-1197; e-mail: frederick.rod@epa.gov.]

Road Maintenance Training Video Set

The San Dimas Technology and Development Center recently released the Road Maintenance video set, a five-part video series focusing on environmentally sensitive methods for maintaining low traffic volume roads. Though the Center developed the set primarily for USDA Forest Service equipment operators, the concepts are applicable to most dirt and gravel roads regardless of location or organization. The set includes the following videos:

- *Forest Roads and the Environment* — A visually pleasing overview of how the road and environment interact with each other. This introduction to maintenance of low volume roads highlights several issues that benefit from proper maintenance activities, including water temperature, fish habitat and aggregate surfacing loss.
- *Reading the Traveled Way* — This segment focuses on understanding what the condition of the road is and providing insights on how to proactively avoid costly repairs by properly addressing the road in its current condition.
- *Reading beyond the Traveled Way* — Properly maintained roads require an understanding of what is happening beyond the road surface. Considering the natural functions before beginning maintenance operations can help minimize significant impacts to the road.
- *Smoothing and Reshaping the Traveled Way* — This video covers detailed step-by-step processes used for both smoothing and reshaping a road.
- *Maintaining the Ditch and Surface Cross Drains* — This provides comprehensive instructions for correctly constructing and maintaining ditches, culverts and various surface cross drains.

[For free copies of the set, contact USDA Forest Service, San Dimas Technology and Development Center, 444 E. Bonita Avenue, San Dimas, CA 91773. Phone: (909) 599-1267; fax: (909) 592-2309.]

Web Sites Worth a Bookmark

Wateratlas.org, www.wateratlas.usf.edu

Wateratlas.org is the gateway to a group of web sites developed by the Florida Center for Community Design and Research in partnership with local, state, and federal government agencies. Their goal is to design a comprehensive online data resource, covering the State of Florida, to help citizens and scientists make informed decisions concerning Florida's vital water resources.

Kentucky Water Watch, water.nr.state.ky.us/ww

The Kentucky Water Watch Project boasts more than 1,500 Kentucky residents who give their time to improve Kentucky waterways through a coordinated campaign of water quality monitoring, skills development, and advocacy. More than 300 organizations contribute to the effort by providing volunteers and staff, technical assistance, and financial resources. The web site contains a multitude of information including a list of volunteer monitoring web sites, listservs for individual Kentucky watersheds, and outreach and communication mechanisms.

National Mitigation Banking Association, www.mitigationbanking.org

Established in 1998, the National Mitigation Banking Association (NMBA) promotes an entrepreneurial approach for restoring America's natural resources. The organization implements this approach through a variety of research, education, and outreach programs.

Datebook

DATEBOOK is prepared with the cooperation of our readers. If you would like a meeting or event placed in the DATEBOOK, contact the *NPS News-Notes* editors. Notices should be in our hands at least two months in advance to ensure timely publication.

Meetings and Events

September 2002

28–Oct 2

WEFTEC 2002, Chicago, IL. For more information, call (800) 666-0206 or e-mail confinfo@wef.org.

October 2002

4–5

2002 Arkansas Watershed Advisory Group Watershed Conference: Watersheds and the Natural State. Little Rock, AK. Contact Donald Anthony at (501) 682-0018; web site: www.awag.org/pdf/registration.pdf.

6–10

Youth Watershed Summit, Edgewater, Maryland. The three-day forum consists of a series of educational, work group and plenary sessions on technical and policy issues concerning watershed protection for 250 students from across the country. Contact Webmaster@acwf.org for more information.

18

National Water Monitoring Day. Citizen monitors, established volunteer monitoring organizations, and federal, state, tribal and local monitoring staff are invited to participate in water monitoring on the 30th Anniversary of the Clean Water Act. Visit the web site at www.yearofcleanwater.org.

21–23

Delaware Erosion & Stormwater Program Conference 2002, Dover, DE. Contact Jeanne Feurer, Conference Coordinator; DNREC Division of Soil and Water Conservation, 89 Kings Highway, Dover, DE 19901; Phone: (302) 739-4411; Fax: (302) 739-6724.

28–30

Senior Watershed Summit, Sandy Cove, MD. America's Clean Water Foundation and the Environmental Alliance for Senior Involvement are joining together to sponsor a national forum to bring together senior citizens from across the nation. Contact Webmaster@acwf.org for more information.

30–Nov 1

World Watershed Summit, Washington, DC. The three-day forum consists of a series of educational, work group and plenary sessions on technical and policy issues concerning international water resource protection issues for 200 government and private sector leaders. Contact Webmaster@acwf.org for more information.

November 2002

3–7

AWRA's 2002 Annual Water Resources Conference. Philadelphia, PA. Contact the American Water Resources Association, P.O. Box 1626, Middleburg, VA 20118; Phone: 540-687-8390; Fax: 540-687-8395; e-mail: harriette@awra.org; web site: www.awra.org.

13–16

National TMDL Science and Policy Conference. Phoenix, AZ. Topics will include how the TMDL process can be improved, how to approach a complex water pollution problem, and how to use practical strategies to protect watersheds. Visit the web site at www.wef.org/Conferences/TMDL2002/opening.jhtml.

16–20

Society of Environmental Toxicology and Chemistry (SETAC) 23rd Annual Meeting. Achieving Global Environmental Quality: Integrating Science & Management. Salt Lake City, UT. Visit the web site at www.setac.org/SLC.html.

Nonpoint Source NEWS-NOTES is an occasional bulletin dealing with the condition of the water-related environment, the control of nonpoint sources of water pollution and the ecosystem-driven management and restoration of watersheds. NPS pollution comes from many sources and is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural pollutants and pollutants resulting from human activity, finally depositing them into lakes, rivers, wetlands, coastal waters, and ground water. NPS pollution is associated with land management practices involving agriculture, silviculture, mining, and urban runoff. Hydrologic modification is a form of NPS pollution which often adversely affects the biological integrity of surface waters.

Editorial contributions from our readers sharing knowledge, experiences and/or opinions are invited and welcomed. (Use the COUPON on page 30.) However, *NEWS-NOTES* cannot assume any responsibility for publication or nonpublication of unsolicited material nor for statements and opinions expressed by contributors. All material in *NEWS-NOTES* has been prepared by the staff unless otherwise attributed. For inquiries on editorial matters, call (703) 385-6007 or FAX (202) 566-1333.

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