



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

Commentary

Encouraging Environment-based Education in our Schools

by Andrew Finch, Senior Director, Education and Environment Program,
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The CWAP logo denotes articles related to action items called for in the President's Clean Water Action Plan. See News-Notes #51 and #52 for more information on the plan.

In September 2000 the National Environmental Education & Training Foundation (NEETF) released a report titled *Environment-based Education: Creating High Performance Schools and Students* documenting current evidence that environment-based education improves academic performance across the curriculum. As used in the report, "environment-based education" is an approach that emphasizes interdisciplinary integration of subject matter, using the school environment as a venue for connecting various instructional methods. Although its immediate goal is improved teaching and learning, an improved environment may follow.

The new report characterizes environment-based education as a maturing discipline that holds great promise and yet faces significant challenges. Illustrating the former, an official from Kentucky observes that "[it] is an ideal thematic approach to integrating subject areas, and it's motivating. It's so good for kids who don't do well in traditional classes." But the same official also says, "We need to help [the educational community] begin to see us as people who are just as interested in improving education as we are in improving the environment. We should be educators first."

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In my opinion, the latter comment points to a critically important challenge for the environmental community: a need to talk about educational outcomes with as much passion and knowledge as it talks about environmental ones. If, as the report suggests, environment-based education should be mainstreamed into the nation's schools, then we need to speak in terms that teachers, principals, superintendents, and school boards can understand and use themselves. Otherwise, if we are heard at all, we will be perceived as people with an advocacy agenda, not an educational one — brainwashers, not teachers.

Environment-based Education, written by Joanne Lozar Glenn with funding support from the AT&T Foundation, is available at www.neetf.org. NEETF commissioned the North American Association for Environmental Education to prepare the document.

As odd as it may seem, I believe that the environmental community can learn from the example of the arts education community. Research shows that the arts, like the environment, offer opportunities to integrate across academic disciplines; to improve overall achievement and attitudes; to incorporate hands-on and inquiry-based learning; and to connect with community organizations that have tremendous, but under-utilized, expertise and resources. Yet arts educators often must defend the place of the arts in the curriculum.

Their solution is one that holds promise for the environmental community. With very modest federal funding, they established an Arts Education Partnership (AEP) run by the associations representing state education and arts agencies. AEP's membership is about 120 national organizations representing teachers, school boards, principals, and superintendents, as well as visual and performing arts organizations, colleges, and conservatories. The business and philanthropic communities are also represented. In sum, it began as a group with common interests but little common language and no shared agenda. Six years later, evidence suggests that arts education is making a comeback in our nation's schools.

At first, provided neutral space in which all parties could meet to talk about the newly passed Goals 2000 education reform act, which provided a framework for state standards in core curriculum subjects, including arts. Then it compiled a research agenda and worked with funders to ensure that the research was actually performed. Notably, it transformed itself into an organization that could promote what the research showed. Over and over, researchers uncovered evidence that arts could be mainstreamed — as we wish the environment to be — and sustained in the schools only with the participation of community organizations, including arts groups but also parents and the business community. And so a major role for AEP now is discovering, nurturing, and disseminating strategies and practices that advance local arts education partnerships.

To be effective, non-school groups had to learn how to talk to those responsible for schools. Arguments based solely on children's need "to express themselves" were, and are, utterly ineffective. That's not to say that they're not true. It's just that principals won't care much about students' ability to express themselves if those same students can't read and write, stay in school, and stay out of trouble. And so community organizations learned to talk about how arts education can be rigorous and standards-based, how it can help schools be accountable, and how it can help improve student performance. At the same time, their knowledge, talent, and passion for art itself made these arguments soar.

And so for the environment. We know that the future of our communities and our nation rides on our success. The environmental community doesn't have to stop voicing this belief; it just has to use it to inform, enrich, and broaden the national debate over better schools. Students must do better in science, math, and reading; they must be able to recognize, investigate, and solve problems in the real world; and they must learn to take responsibility for their own learning. Using an environment-based approach, they will learn more about responsible environmental stewardship along the way.

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Special Focus: Information and Education

Art as Environmental Education



What do you think of when you see an aerial photo of Las Vegas? Some think the lush green city surrounded by stark desert is a success story — another triumph over nature. Others think the picture typifies our tendency to waste natural resources and ignorantly change an entire ecosystem. But no matter what their view, at least they are thinking about it. That is the goal of many artists with an interest in ecological issues. Using environmentally related photographs, maps, and theater, many artists with an interest in environmental issues communicate environmental concerns to the public and propose ideas about how to solve environmental problems; this can be a great way to get people thinking. Unfortunately, the scientists who have the ability to help solve these problems often do not have the opportunity to communicate with the artists. Last December, Claude Willey, an art graduate student at the University of California–Irvine, held a cross-discipline conference to bring artists and scientists to the same table to exchange ideas and explore their common goals.

Bringing Diversity to the Same Table

The goal of the two-day conference, titled *California Water and Waterways: Artist Intervention in Preservation*, was to blur the lines between scientific investigation and artist exploration by focusing on the common issue of prolonged survival in a semi-arid desert region. “People see art and science as two very different disciplines and they cling to the isolation accordingly,” explained Willey. “I see many similarities between the goals of the artists and the scientists and I knew I had to get them together.”

The conference, funded through grants from the university, drew 19 presenters and more than 50 interested stakeholders. Artists shared the diverse methods they use to communicate their ecological messages, including photographs, maps, 3-D models, and street theater. Area water providers, consultants, and researchers discussed new technologies, water conservation, groundwater replenishment, reclamation, nonpoint source pollution, and long-range projections for protecting southern California’s water supply. “The participants realized that most of our natural resource problems are not going to be solved by one discipline alone. Solutions will require the combination of different perspectives and skills,” said Willey.

Understanding Science Through Art

Conference presenters included internationally recognized ecoartists Helen and Newton Harrison and Peter Fend. These individuals use art to document large-scale environmental problems and propose solutions, working closely with scientists and policy-makers to generate ideas and action.

In a 1989 exhibition in Europe, the Harrisons displayed photographs, maps, and text to communicate problems faced by Yugoslavia’s Sava River. Their exhibition led the governments in the Sava River watershed to develop cleanup plans for the river, which were unfortunately interrupted by war.

Fend is hoping that his recent exhibition “China Basin Plans: The River Dragon Breathes Fire” will generate change in China. To prepare the exhibit, Fend worked closely with scientists, architects, and other artists to develop a 3-D model of large earthworks and other structures that he believes could be built to reduce the impact of the controversial Three Gorges Dam under construction on China’s Yangtze River.

The conference also highlighted several examples of the link between art and science on a more local level. Conference presenter Jerry described his efforts to develop a large photographic mural in a community park to protest the development of California’s Laguna Canyon, a unique wild area. Burchfield invited the community to post photographs that represented what they loved about the area. The response was tremendous — the mural included more than 80,000 photographs. It served as a catalyst to energize the community about the need to preserve this environmental



These artists use street theater to get their environmental message across.

treasure. A few months later more than 10,000 community members joined a march at the Laguna Canyon site that convinced the developers to change their plans.

Other artists combine science issues with “activist art” to communicate their message. Los Angeles residents Susan Suntree and Jan Williamson explained how they use street theater to increase wetlands awareness. Their new production, “Saving Private Pickle Plant,” is an educational satire that focuses on preventing a planned development that would destroy the Ballona Wetlands, some of the last remaining wetlands in Los Angeles. They even took their production to New York, where they performed in front of a financial institution to protest the company’s funding of the project. “This type of theatrical storytelling is designed to attract public and media attention,” explained Willey. Their fight to preserve the wetlands continues today. (Visit them on the web at www.thelyp.com/frogworks for more information.)

Without realizing it, many scientists also use art to convey information, and the conference helped to prove it. Stan Grant, a researcher at the University of California–Irvine discussed his time-elapse video showing the “intricate dance” that fecal coliform bacteria perform off of Huntington Beach, California, as their levels oscillate daily. People watching the video can see and appreciate the dance patterns, but at the same time they are thinking “Wow, that is a lot of bacteria. Where does the bacteria come from and what can we do to keep the levels low?” Grant is trying to find out. This type of art can help stimulate science to solve problems. After all, if you don’t see the problem, how do you know there is a problem?

Similarly, Betty Olson, a professor of Social Ecology and Environmental Medicine and an Irvine Ranch Water District board member, showed conference attendees beautiful photographs of colonies of bacteria taken on the inside of potable water pipes in Orange County, California. But the same pictures also show the ugliness of hidden contamination problems in the ancient pipes of the local water supply system. She explained that the Irvine Ranch Water District is now working on ways to update the old infrastructure.

Art is All Around Us

Everywhere you look these days you see colorful posters promoting everything from movies to clothing. If you know where to look, you can find similarly eye-catching environmental education posters to hang in your office or schoolroom. Many federal agencies, such as EPA (www.epa.gov/ncepihom/catalog.html, search on “poster”) and the U.S. Geological Survey (water.usgs.gov/outreach/OutReach.html) give away free posters. Posters are also frequently available from your local and state environmental agencies. Contact them for further information.

Many private organizations also sell posters and other types of artwork for environmental education. For example, Terrene Institute develops and sells environmental posters in both English and Spanish at a reasonable cost. In operation since 1990, Terrene has given away or sold hundreds of thousands of posters. “People grasp concepts more readily when they see pictures,” explained Judy Taggart, executive vice president of Terrene. Some posters are very targeted, such as *Golf and the Environment: What Partners* poster, while others, like *Watershed Management: A Community Process*, are more general in focus. For a list of available products and to print out an order form, visit www.terrene.org. For more information, contact Terrene Institute at (703) 548-5473 or e-mail: terrinst@aol.com.

Building New Bridges

A couple of multi-discipline efforts are now in progress as a result of the conference. The Orange County Water District asked Willey to help them develop an art-based water resource education program for schoolchildren. Artists planning a show in a Laguna Beach gallery this spring invited some of the scientists to display their science/art work for the public. Although he doesn’t know of any other collaborations between scientists and artists planned as a direct result of the conference, Willey believes the conference was a step in the right direction.

“The conference was a great success. Initially I had a difficult time enticing some scientists to attend because they were unsure how art and science could be related,” explained Willey. “I can definitely say that all the artists left with new perspectives and those from other disciplines emerged with new ideas for the possibilities for art. The scientists now understand how art can help them increase awareness about problems and develop solutions. The artists now better understand the technical issues raised by the scientists and have ideas for new artwork. I hope this event will be a starting point for further activities.”

[For more information, contact Claude Willey, University of California-Irvine, 3502 Lotus Street, Irvine, CA 92606. Phone: (949) 824-6648; e-mail: cwilley@uci.edu.]

Lake Champlain Basin Program Partners with Local Television Station

When the Lake Champlain Basin Program (LCBP) sets out to spread the word on protecting their precious lake and its resources, they really mean it. Since May 1999, the Basin Program has worked in partnership with WPTZ, the Champlain Valley's local NBC affiliate, to air weekly news stories on the six o'clock evening news. The effort, dubbed *Champlain 2000*, educates the public on issues that affect the environment and quality of life in the Champlain Valley and spotlights the people and projects that protect the basin. A third partner, KeyBank, is a commercial sponsor.



Although forested lands account for more than half of the land uses in this 8,234-square-mile basin, urban sprawl is beginning to rear its ugly head. Sprawl brings more people, more cars, more impervious surfaces, and more runoff. In fact, nonpoint source pollution is estimated to account for more than 80% of the total phosphorus — one of the lake's biggest problems — entering the lake. Urban nonpoint sources of phosphorus are estimated to account for about 37% of the total NPS phosphorus load to the lake. Urban sprawl is of concern not just for phosphorus, but also for sources of toxic substances such as pesticides, oil, and gas in runoff.

The Lake Champlain Basin Program (LCBP) is a partnership between the states of New York and Vermont, the Province of Quebec, EPA Region 2, other federal and local government agencies, and many local groups, both public and private. Created by Congress through the Lake Champlain Special Designation Act of 1990, the LCBP's goal is working to implement a comprehensive management and restoration plan for the Lake Champlain Basin. With offices in both New York and Vermont, LCBP staff are employees of the New England Interstate Water Pollution Control Commission. Fifty-six percent of the Basin lies in Vermont, 37% in New York, and 7% in Canada.

Over 90 news stories have aired to date every Monday night, covering issues such as lawn and garden pesticides' link to phosphorus-laden runoff, the invasion of the nonnative zebra mussel and water chestnut, phosphorus management on farms, bacterial pollution, and student efforts to replenish Atlantic salmon. The LCBP's outreach staff provide story concepts, contacts, and further information about each story on the LCBP website (www.lcbp.org). WPTZ tapes, airs the stories, and posts the scripts on its website (www.wptz.com/c2k.html). While WPTZ maintains all editorial control, the news team solicits LCBP's help to maintain a balanced viewpoint in all stories.

In addition to the regular Monday night features, has also aired four half-hour quarterly specials. The December 2000 special covered mercury and its impacts on human health and Lake Champlain's ecosystem. Last summer's special focused on recreation, including the Paddlers' Trail, Bikeways, and the *Celebrate the Lake!* Festival — all of which are supported by the LCBP. Because the stories aired by WPTZ are news stories (not public service announcements), WPTZ presents unbiased accounts of each topic, lending more credibility and importance to the stories. According to Nicole Ballinger, the communications and publications coordinator for *Champlain 2000*, "the stories of people and projects in their watersheds can be very newsworthy, and we've learned that you don't always have to pay for ads or public service announcements to get the word out."

Champlain 2000 has also won several awards. Last November, *Champlain 2000* received a Vermont Governor's Award for Environmental Excellence in Pollution Prevention for its innovative for-profit/not-for-profit partnership to raise public awareness about environmental issues. In April 2000 the *Champlain 2000* partners also received EPA Merit Awards from Region 2 and a media award from The New York State Department of Environmental Conservation. *Champlain 2000* has also earned two regional Edward R. Murrow Awards from the Radio and Television News Directors Association and was nominated for an EMMY. By leveraging outreach staff time with WPTZ's estimated \$200,000 commitment to *Champlain 2000*, the LCBP is increasing awareness and understanding of watershed issues at minimal expense.

[For more information, contact Nicole Ballinger, Communications & Publications Coordinator, Lake Champlain Basin Program, P.O. Box 204, 54 West Shore Road, Grand Isle, VT 05458. Phone: (802) 655-6382; e-mail: nicoleb@anrmail.anr.state.vt.us; web site: www.lcbp.org/cham2000.htm.]

Trading Coffee for Water Quality Improvements

The two main rivers in southwestern Minnesota that flow into the Minnesota River have been jointly managed by an eight-county organization since 1983. The Redwood-Cottonwood Rivers Control Area board (RCRCA) has, over the years, garnered high levels of participation by watershed constituents, particularly local farmers, in pollution control programs that have focused on the rivers. How? Right from the start, their program paid attention to public perception of the water systems and communication delivery. Then, they crafted effective though unusual outreach strategies. The result? Community awareness, open exchanges, and ownership of solutions to their water quality problems.



To talk about the outreach strategies is premature without a background on the water quality programs. The Redwood River was the first to receive a Minnesota Pollution Control Agency (MPCA) Clean Water Partnership (CWP) grant to monitor water quality and develop an action plan for cleanup. The river was historically dammed at the town of Redwood Falls, creating a 28-foot-deep reservoir that was used for swimming, waterskiing, and fishing. Over time, sedimentation problems caused by topsoil loss in the agricultural watershed filled in the reservoir, leaving only 2 feet of water. Local citizens were distraught over the loss of this resource. They discussed it in supermarket lines and coffee shops around town. Enough momentum gathered in their voices that community leaders had to address the problem. They coordinated attention and resources to create the Redwood River Clean Water Project.

The goals of the CWP plan were to reduce sediment and nutrients by 15% to 30%, stabilize flows, expand fishery habitats, and improve fishery spawning in the river, reservoir, and tributaries. At the start of the six-year implementation plan for the CWP, a public perception study conducted in conjunction with the University of Minnesota solicited public opinion on water quality, as well as on how people received their information. Residents, it turned out, viewed their river as a ditch: a drainage system at the edge of their fields or a conveyance for water through the landscape. In their mental maps of the community, people did not associate the river with their land or see how their lives related to it; nor did they see it as a significant recreational resource.

The CWP action plan addressed this issue. Its mission statement stated that promotion of appreciation of the Redwood River, establishing a ‘watershed identity,’ and achieving land-use changes were all necessary to restore the health of the river. All these required the community to be key players in the effort. Furthermore, in a watershed where the predominant land use is row crop agriculture, an “aggressive, systematic program leading to the adoption of a wide range of agricultural best management practices within the watershed” was the only way to hold water on the land and reduce sediment delivery during heavy rainfalls.

To address these public involvement needs and encourage farmers to adopt BMPs, hit the streets in 1996 and headed for the same coffee shops where water quality was first voiced as a topic of concern. The “Coffee on the Project” program was born of RCRCA treating people to coffee and rolls in a local coffee house from 6 to 9 a.m. — a time when people would normally drop in to grab their morning coffee before working in the fields. RCRCA used each coffee shop site for a whole week, over a period of several weeks in the spring. They visited coffee shops up and down the length of the watershed. Armed with information, posters, and charts showing monitoring data, information about topsoil loss (a large concern to farmers), and BMPs and their costs, they offered not only coffee and conversation, but technical detail in a way that was easily digestible.

The cafe setting was neutral territory, according to Sue Beran, the watershed coordinator responsible for outreach and education at RCRCA. She said, “Setting the outreach in a cafe changed the dynamics. It wasn’t about the authorities coming to inspect the landowner’s property and it didn’t set up the classic us/them dichotomy. They weren’t expected to do or show us anything, and in fact they were disarmed because we treated them to coffee.” This was a way to hear the real concerns of landowners without worry. Seated next to their neighbors and with others in the community, the citizens were more relaxed and they felt it was “safer” for them to be confrontational about issues with the RCRCA.

After it caught on along the Redwood River, “Coffee on the Project” started up a couple of years later on the Cottonwood River, when the CWP for that river was initiated. Through four consecutive years, at established cafes in the watershed, it became an anticipated annual springtime feature. People began expecting the Coffee Project to stop by; they brought family members and neighbors. It facilitated an important information exchange opportunity, where people could talk with each other about their land management issues, as well as meet with the RCRCA technical experts and get the latest information.

“We had a range of audiences,” said Beran, “the early birds were the farmers who came out before planting. We addressed topsoil, BMPs, and cost-sharing. Later on we got some of the people who were starting office jobs to listen in on some of the discussions and pick up flyers.” The community started to gain a real sense of how important water quality is to their land and their community.

To broaden the audience, segments of the coffee project discussions were broadcast on local radio, including live interviews with some of the innovators in the watershed. As with any new technology, concept, or product, RCRCA identified those willing to try certain BMP combinations out before others. They hoped that the innovators would motivate the laggards and bring more momentum to BMP adoption down the watershed. Often, people could not make it to the cafes but would listen to the radio in the mornings, some even on their tractors.

The sessions were so popular that they attracted a loyal band of followers, who now expect RCRCA organizers to show up regularly. It’s become a regular party for the landowners, who use the time to get their questions answered, as well as air their opinions and learn about the results of monitoring on their river. One discussion session that focused on canoeing the rivers was so popular that a “Canoe the River” day resulted. RCRCA rented canoes for nearly 75 kids and adults who canoed down their river, with participants and RCRCA representatives explaining riverine health indicators. An MPCA official brought equipment to show the community how turbidity was monitored, and pointed out monitoring locations along the river. This way, cafe discussions compared turbidity measurement results with improved land practices such as conservation tillage.

For RCRCA, the outlay of dollars for coffee and rolls and the development of outreach posters and exhibition materials has reaped enormous rewards. Water quality benefits are tangible; seeing different land-use behaviors and measuring lower turbidity on an annual basis is gratifying. But the rewards that come with teaching, communicating openly, and increasing public awareness, is probably greater. RCRCA has sparked a feeling of personal and community investment in stewardship, engendering an identification with the rivers that is priceless. The sense of ownership of their resource has made all the difference in the water quality because now it matters to the residents; it’s not just someone else’s problem.

[For more information, contact Jim Doering, Redwood-Cottonwood Rivers Control Area, 1241 East Bridge Street, Redwood Falls, MN 56283. Phone: (507) 637-2142 ext. 4; web site: www.rcrca.com.]

An Elementary School Backyard: The Start of Big Things



Castro Valley, an unincorporated suburban community, lies east of the bustling San Francisco Bay metropolis, in Alameda County, California. Many families here choose not to send their children to local schools or to those in the east bay cities, but to more rural schools. A small four-room elementary school on a rural canyon road in Palomares is home to 92 students who are either carpooled or driven by their parents. The setting offers a clue as to why parents might make this commute.

Imagine going to a school where the playground includes an open meadow with a creek flowing at its edge. A primitive trail provides access to the creek and a wooded hillside rises behind the school. Children are surrounded by trees and water in a natural, semi-wild environment. But more importantly, they are also offered an expanded environment-based curriculum.

A Setting for Action

When Alameda County's Resource Conservation District (RCD) office was developing watershed-wide action plans for upgrading Palomares Creek's water quality, they knew public outreach efforts would be critical. Christy Johnson of the RCD said, "Getting people to change littering behaviors or careless use of the stream and its banks cannot be left at sending brochures to their homes that might lie unread on a kitchen table." To effectively deliver the message about living right with the creek in the backyard, the county decided that a tangible restoration site demonstrating exemplary creek management would address their goals.

Palomares Site Activities

Current:

- ◆ Creek cleanup
- ◆ Wildlife/wildlife habitat improvement
- ◆ Revegetation of the hillside with native species
- ◆ Rebuilding a hiking trail

Future:

- ◆ A separate environmental center with space for teaching materials and desks
- ◆ Development of a recycled materials playground for the kids
- ◆ Community environmental fair
- ◆ Community-based effort such as "Friends of Palomares Creek" to take on watershed stewardship

With the beautiful backdrop, a ready-made audience of eager young environmentalists, the presence of committed educators, and a natural community focal point, Palomares Elementary School was an ideal setting. The presence of the model restoration site at this school would not only add to the water quality of the creek, but also become a community educational and recreational resource.

Funding for the project came from many sources, who saw in it a multi-faceted project to address several community resource needs and diverse opportunities. Alameda County was the recipient of a section 319 grant of \$300,000, half of which was allocated to the Creek restoration site at the school. Alameda County Public Works Agency contributed and sponsored the involvement of the Alameda . Pacific Gas & Electric and the National Fish and Wildlife Foundation provided a joint grant, and Castro Valley School District also contributed.

Representative Ellen Tauscher (D-Contra Costa & Alameda Counties) was impressed enough with the scope and breadth of the project that she helped secure federal funds for the project and released a statement in Washington, DC, saying, "The Creek project is the perfect example of the federal government, private industry, and a local school community coming together to solve a local environmental problem. By restoring the watershed and rebuilding the hiking trails, we are adding to the community and increasing our quality of life."

Natural Innovation at the Site

What better way of teaching the benefits of preventing creek siltation and littering than by offering the wholly pleasant experience of walking along a beautiful creekside trail while strategic signboards along the way explain the importance of watersheds, ecosystems, and their health? Using grant monies, the project team cleared and restored an old existing trail to prevent erosion into the creek and put up environmental education signs along the walk.

What more effective way to teach stream bank restoration than to show that without pouring concrete, natural biological restoration methods work to stabilize banks? The team also put in more stable bends on the trail, secured slopes and banks by planting willows, employed strong rooted trees and other bioengineering methods, and installed a wooden bridge across the creek to prevent trampling.

Natural Teaching Assets

School principal Denise Hone says, "Teachers have capitalized on their 'natural' assets and sunk their teeth into an expanded curriculum based on environmental science and nature to simultaneously use their backyard resources and try to meet the goals of the California standards."

In addition, teachers at Palomares Elementary received a grant from EPA to develop curriculum similar to an Adopt-A-Watershed program, and were able to participate in a "retreat," specifically to develop Environmental Integrated Curriculum (EIC) modules based on their school's backyard. The EIC is a national program outlining approaches to environmental education. Lessons pinpoint topics of study such as erosion in a watershed or the growth cycle of butterflies, while teaching skills in math, reading and writing, critical thinking, and the interconnectedness of disciplines.

Hone emphasizes the ownership that students feel when they do projects in their own backyard. "Students have a vested interest in concepts like erosion and pollution because they can identify

where it happens, how it happens, or see it happening.” Teachers measure success by their students’ visible enjoyment of activities and lessons, in insightful comments that their students make about the natural processes around them, and in students using words such as “source pollution.” One kindergartner who saw the connection between rain and erosion commented, “Look — the rain is running down the hill and into the Creek.” The small start of a big awareness.

The lesson plans developed by the Palomares teachers form a web of learning based on their creek site environment and address achievement criteria set out in state standards. They are available in stand-alone binders at the school, and are available to other teachers. Now, area schools bring classes of students into Palomares for day programs, and are using those same lesson plans. The RCD outreach effort to restore Palomares Creek has, through the school, established the roots it needs for fostering awareness of watersheds, habitats, and natural life-systems, as well as human impacts, erosion, and the potential for pollution.

A Separate Environmental Center

As part of the last phase of the project, Palomares hopes to develop a separate environmental center and a playground built entirely of recycled materials. “The educational focus of the school,” says Hone, “is on environmental education and its use as a mode to accelerate our math and science programs. In this, we aim to become pedagogical models.” Indeed, there is already a demand to have a classroom base for outside schools who visit the creek site and want space to undertake *in situ* learning modules.

The RCD wants the environmental center to become a reality because they envision further community sponsorships through it, for programs such as Community Creek Day, expanded science fairs, exhibits, and resource protection outreach opportunities. Community fairs are an opportunity to show off the creek’s restoration as well as reach out to creek-side dwellers and other recreational users of the creek. RCD is already overseeing the construction of the ‘recycled playground’ by a contractor.

“Kids bringing awareness home, and then involving their parents in science projects, homework assignments, and fairs is a powerful way to bring the stream and its restoration out into the community at large,” said Christy Johnson. Eventually, the RCD hopes that community efforts will take over the running and oversight of the creek trail and boards along with the school. A “Friends of Palomares Creek” organization is envisioned as part of the long-term plan. This is one schoolyard shaping a big future.

[For more information, contact Ron Harben, Alameda County Resource Conservation District, 1996 Holmes Street, Livermore, CA 95440. Phone: (925) 371-0154 (ext. 41); e-mail: rharben@baysavers.org.]

Hydroexplorer Lets Kids Discover River Science



Have you ever imagined being a captain of a submarine, piloting treacherous waters on a scientific discovery expedition? If the real thing seems a bit far-fetched or out of reach, acting out the role in a simulated setting is probably a close proxy. Such first-person simulation is a proven instigator of the mind-set and intrigue that fosters reactions and creative thinking. It is the same mind-set that is required for meaningful learning.

Hydroexplorer is a computer game released by the nonprofit organization Water Education Foundation (WEF) based on this role-play model. Middle-school-age submarine captains navigate a modern river where they investigate the river’s ecology and geography to report findings and answers back to “mission control.” Good answers to the river problems yield good scores. The game’s educational message is focused on river-based environmental science. The delivery of the message, however, relies on the learning aspect of “playing,” as well as delightful graphic design. ‘Mission control’ wants to know the condition of marine organisms, the river banks, wildlife refuges, uses for which water is taken out, and dams along its route. The captain then stops Hydroexplorer at stations along the river and sends up the investigative periscope for a view of the surrounding environment. The interactive nature of the game makes details jump out and clearly reveals the interrelatedness of action and consequences.

Ready to Play Yet?

Judy Wheatley at WEF in Sacramento, California, who developed the game, used scanned images and slides taken of locations along the Rio Grande for the station environments. The images reveal hidden answers to mission control's questions. While this version of Hydroexplorer is based on the Rio Grande River, earlier versions have been written for the Sacramento, American, and Colorado rivers. WEF won grants from three sources to develop the game, including the Northern California Geography Teachers Alliance, California's Department of Water Resources, and the Bureau of Reclamation, which is sponsoring the game as part of its outreach to foster stewardship attitudes in the general public and promote interest in science.

Game Explains History of Water Use

In the name of exploratory education, another product developed by the Water Environment Federation (WEF) on CD-ROM called Aqua Venturer® highlights the role of clean water in the development of civilizations. Aimed at secondary school age children, the multimedia game uses video clips, music, interesting anecdotes, and pertinent illustrations to address historical topics such as how water determined life in ancient Rome, how water was managed in the development of European urban areas, and how it was used in agrarian societies of the past. In fact, the game spans 10,000 years of history. The Aqua Venturer® CD-ROM is Macintosh and Windows compatible, and is priced at \$30. For more information visit WEF on the web at www.wef.org.

"This game is appropriate for children from upper elementary to middle school grades who have the required finesse at computer navigation and are ready for the challenge of random questions," says Wheatley. "This makes them absorb new and different components of the river story each time around they play." The game also involves mouse dexterity skills and cute graphics; for example, if you run into a school of fish they turn into a school of fish skeletons and you lose points. If you can aim the trash from the river into the trash collection receptacles on the banks, you score even higher!

Currently Hydroexplorer is available for eager environmental gamers at WEF's web site: www.watereducation.org. It has also been distributed under grant money to school districts down the Rio Grande watershed, including those in Colorado, New Mexico, and Texas, as well as to visitors centers at parks, science and environmental facilities, and wildlife refuges.

It is also distributed to Project WET (Water Education for Teachers), another initiative organized in California by WEF, to develop and implement education programs leading to a broader understanding of water issues and resolution of water problems. Project WET specializes in curriculum supplements that meet specific goals of state educational standards. WET is also distributing other river versions of the game, including a Colorado River version along with curriculum modules on the Hoover Dam.

Water Conservation is Child's Play

A new interactive CD, *Ribbit's Big Splash*, is making learning fun for children in grades 3 through 6. Developed by the nonprofit Alabama-based Project CATE (Conservation Action Through Education) Foundation, the CD teaches about water and environmental conservation using stories, projects, games, and other interactive activities. The CD's main character, a friendly frog named Ribbit, introduces users to the different types of surface water resources found in Alabama, including rivers, lakes, wetlands, and the Gulf of Mexico. Ribbit explains why each is important and offers ways the user can help keep them clean. Although the CD features some information specific to Alabama water resources, most of the content focuses on general water resource education. CATE offers the CD at no charge to school teachers. The CATE Foundation is currently developing five companion CDs focusing on wildlife, soil, air, recycling, and energy. For more information or to place an order, see www.projectcate.org or contact the Project CATE Foundation, P.O. Box 123, Mobile, AL 36601; phone: (334) 694-6247; e-mail: neilj@handarendall.com.

A version of Hydroexplorer for younger kids, "Hydroexplorer Comes to Your Home," is designed to teach elementary students 5 to 10 years old about water conservation, pollution prevention, the hydrologic cycle, and how water gets to the home. Using basic computer skills, players search for clues as they guide the mini-sub from a rain cloud through the maze of water pipes underground, through the treatment plant, and into either a house or an apartment. Players tour the floor plan, seeking out opportunities to make wise water use choices. For example, while answering questions like, "Do you keep the water running while brushing your teeth?" kids learn about water conservation and proper uses of water. The game uses pictures and voice-overs to help children with limited reading or language skills. It includes math worksheets to reinforce water conservation concepts.

[For more information, contact Judy Wheatley, Water Education Foundation, 717 K Street, Suite 517, Sacramento, CA 95814. Phone: (916) 444-6240; e-mail: jwheatley@watereducation.org.]



Education has gone outdoors, using wildlife habitats on school grounds to relate the natural world to all studies at all grade levels — from science to art, K through 12. How many schools have created wildlife habitats? They're found in all 50 states — with significant numbers in Georgia and South Carolina — but the exact number is not known. Many post the attractive aluminum Schoolyard Habitat sign signifying that they are one of more than 1,300 schools certified by the National Wildlife Federation's Schoolyard Habitats Program. Other schools with impressive habitats have, in one teacher's words, "just not taken the time to fill out the NWF application." Those that do find that certification brings national recognition, media attention, access to NWF's *Habitats* newsletter, and opportunities to network with other schools engaged in similar projects.

NWF certification is based on "assurance that the habitat is being used to improve instruction, using elements of the habitat as a teaching tool," said Julie Totaro, Schoolyard Habitats Program Coordinator for the National Wildlife Federation. Schoolyards can become an important part of a functional ecosystem that not only provides essential wildlife habitat and tools for learning, but also provides important green space that helps to filter stormwater runoff and improve water quality.

An NWF application includes a detailed site map (which can be drawn by students), photographs, the ways in which the site is providing food, water, cover, and places for wildlife to raise their young (e.g., nest boxes, plantings, birdbaths, and so on), a maintenance plan that assures the project's sustainability, and a list of team members. The "team" is vital to all school habitat projects. In addition to students and teachers, a Habitat team usually includes at least one member of the school administration, parents, and often, community members.

Wild School Sites

"It takes more than one teacher to make a habitat project work," observed Katrina Macht, whose fifth graders at Hillside Elementary in Bridgewater, New Jersey, five years ago raised funds to build a wetland, and thus sparked a schoolwide Hillside Meadows & Trails program. The 15 X 5-foot freshwater marsh that Hillside School built two years ago has been named as one of five original sites in New Jersey's Wild School Site Program. "On our 6½ acres, Hillside is now planning to build habitat islands native to New Jersey," Macht said. The first island will be a successional forest woodlands. Hillside's Outdoor Site Committee of parents, students, teachers, and community members oversees the project. Student Environmental Leaders & Protectors assume responsibility for maintaining the habitats.

Exemplary School Projects

Nine years ago, urban Arlington County, Virginia, began funding "Exemplary School Projects" in schools wishing to involve students in nontraditional education activities. Oakridge Elementary School, with a highly diverse multi-cultural student population, qualified for such a project. Named "Planet Earth Trek" — PET, for short — the project combines science with math and technology to focus on the environment. Capitalizing on the wooded hill bordering the school, the project first built a trail down the hill to neighboring Gunston Middle School. Boy Scouts working for Eagle badges helped build an outdoor classroom that includes a bridge over a wetland and benches beside the stream that runs over the hill.

"We've tried to link as many instructional units as possible to the outdoors and the nature trail," explained Project Coordinator Mary Rita Prah. Stopping erosion was the next project when that need became apparent on bare ground beside the playground; students created a garden with appropriate plants — that also attracted butterflies. "Third graders know the butterfly garden is theirs, and they take care of it," said Prah. Then first graders planted a vegetable garden, and, last year, three gardens were built outside the kindergarten rooms in shapes kindergartners were learning — a rectangle, triangle, and square. Fourth graders are now planning a colonial native plants garden.

"We also have a primitive weather station — and put in a pond last year," Prah said, observing that Arlington Schools' Maintenance Department dug the hole: "They've been incredibly helpful with things like this." As have dedicated neighborhood volunteers: among them, National Wildlife

Federation Habitat Steward Sue Haight, whose children went to Oakridge, and more recently, a member of the Northern Virginia Native Plant Society.

In January 2000, Oakridge became the first school in Arlington County to earn the Schoolyard Habitat designation. And, as Prau pointed out, kept proving the validity of recent studies that show students do much better academically when environment is integrated with learning.

NWF Schoolyard Habitats Program

Teachers in five Arlington County schools went through NWF's original year-long training; it has now been reduced to two days given by NWF's nine regional offices. NWF's program originated in its Backyard Habitats Program, launched in 1973. Totaro recalled "Over the years, we found increasing interest from schools in habitat creation and restoration." To better serve schools' unique needs, NWF began the Schoolyard Habitats Program in 1996.

NWF offers a Schoolyard Habitats Kit (\$14.95) with a Planning Guide and other resources to schools starting a habitat project. To order a kit, phone (716) 461-3092. The application fee for certification is \$14.95; once certified, schools can order the Schoolyard Habitat sign for \$28. See the NWF website, www.nwf.org/habitat, for more resources.

[For more information, contact Katrina Macht, Hillside School, 844 Brown Road, Bridgewater, NJ 08807; (908) 231-1905 ext. 307; Mary Rita Prah, Oakridge School, 1414 South 24th Street, Arlington, VA 22202; Phone: (703) 228-8165; e-mail: mrprah@tmail.arlington.k12.va.us; Julie Totaro, Schoolyards Habitats Program Coordinator, National Wildlife Federation, 11100 Wildlife Center Drive, Reston, VA 20190; Phone: (800) 822-9199; e-mail: totaro@nwf.org.]

Awards as Tools for Information Exchange

Organizations frequently use award programs to recognize individuals, communities, and organizations for their efforts to improve environmental quality. Awards typically include public recognition, a plaque or trophy, and/or a monetary award. The goal of many award programs is not only to recognize those individuals or organizations who show exceptional or innovative environmental stewardship, but also to encourage others to follow the winners' example and provide them with the information needed to do so.

Award program sponsors can vary as much as the programs themselves. Sponsors can range from small nonprofit conservation groups to large private companies. The programs can be open to the general public or be limited to a particular sector. No matter the size or the scope of the program, the program sponsors all hope that their efforts to recognize good stewards serve as incentive for others to implement good practices.

The National Cattlemen's Beef Association

The National Cattlemen's Beef Association (NCBA), a nonprofit trade organization, offers an Environmental Stewardship Award Program (ESAP) to cattle producers whose business practices not only protect the environment but also enhance productivity and profitability. The Association recognizes seven regional award winners each year, from whom one national winner is selected. Regional winners receive a small bronze statue and a free trip to both the NCBA summer conference and the annual cattle industry national convention in February. Each winner is featured in a video shown at both events. The national winner, announced at the annual convention, receives a larger bronze statue and additional public recognition. (See the box on page 13 for national and regional award winners for the year 2000.) Applications for the 2001 ESAP were due by March 7. For more information, contact Walt Smith, NCBA, 1301 Pennsylvania Avenue, NW, Ste 300, Washington, DC 20004. Phone: (202) 347-0228; e-mail: wsmith@beef.org; web site: <http://hill.beef.org/esap>.

CF Industries

Every year CF Industries, a farmer cooperative based in Long Grove, Illinois, collaborates with the national nonprofit Conservation Fund to give a National Watershed Award to three U.S. Communities and one U.S. corporation for their innovative local partnerships that seek to improve water quality by balancing a watershed's environmental and economic needs and emphasizing economic incentives, voluntary initiatives, and education. "Our goal is to reward innovative nonregulatory



approaches to nonpoint source pollution prevention and to make the information from recipients available to everyone else,” explained CF Industries’ Jesús Peralta. “We are now seeing that the information exchange is doing what we had hoped. Each year more winners mention that they used the experiences of past award recipients to make their projects better.” Award winners receive a framed certificate, a nominal cash stipend, and recognition at an awards ceremony in Washington, DC. (See the box below for descriptions of the 2000 National Watershed Award winners.) Applications for the 2001 National Watershed Award are due by June 1.

[For more information, contact Jesús Peralta, CF Industries, Inc., 1401 Eye Street, NW, Ste 340, Washington, DC 20005. Phone: (202) 371-9279; e-mail: jperalta@cfindustries.com; web site: <http://terrene.org/cf> or www.cfindustries.com.

National Cattlemen’s Beef Association’s Year 2000 Environmental Stewardship Award Program Winners

National Award Winner: The Association recognized William, Craig, Brad, and Kirk Utesch of the Triple U Ranch in Correctionville, Iowa, for their continued commitment to conservation. To control runoff and erosion from their cattle feedlot and cropland, the Utesch family has constructed more than 10 miles of terraces, employs contour farming, and uses minimum and no-till practices. To capture runoff from the land, the family constructed a system of nine sediment control basins and farm ponds that also serve to water the cattle.

Regional Award Winners: The Association selected seven regional winners for their use of good conservation practices such as good waste management practices, erosion control, alternative watering systems, and sediment collection ponds. The winners included Greg and Joan Ritter’s Beef Cattle Farm, Glasgow, Kentucky; Gaddis Farms, Bolton, Mississippi; Morgan Cattle Company, Chickasha, Oklahoma; Triple U Ranch in Correctionville, Iowa; Hanson Livestock Inc., Lusk, Wyoming; Cammack Ranch, Union Center, South Dakota; and Johnson Ranch, Rush Valley, Utah.

CF Industries’ Year 2000 National Watershed Award Winners

Please note: Because the community applicants were so strong in 2000, CF Industries chose to offer the award to four communities instead of the usual three communities and one corporation. A corporation was not selected in 2000.

■ *The Chain of Lakes Clean Water Partnership, Minnesota.* This large urban watershed restoration initiative is driven by local watershed groups, city managers, and a 42-member citizens advisory committee, and funded and managed by a partnership of six governmental agencies and cities. Their success is due in part to a homeowner education program that uses a variety of outreach methods to convey watershed messages. Through the program’s assertive efforts to create wetlands, restore degraded shorelines, and improve storm water management practices, the water quality in one of the lakes, Cedar Lake, has been the best documented in 30 years. For more information, see www.minneapolisparcs.org/dist_CL.htm.

■ *Careless Creek Watershed, Montana.* Landowners, agencies, and interest groups work together to guide watershed activities and resources. The partnership has helped to minimize stream bank and channel erosion, apply best management practices on agricultural lands, and improve fisheries and habitats

throughout the watershed. Most importantly, this project’s success has encouraged the development of other watershed groups in central Montana to organize. For more information, see <http://lmcd.mt.nacdn.net.org>.

■ *The Sugar Creek Watershed Program, Missouri.* The program partners have developed a nonregulatory landowner-driven Agricultural Non-Point Source (AgNPS) Special Area Land Treatment (SALT) Project through which they guide the implementation of voluntary, incentive-based conservation practices that protect soil, water, habitat, and wildlife resources while allowing farmers to meet their production objectives. For more information see <http://outreach.missouri.edu/mowin/agnps.html>.

■ *The Tampa Bay Estuary Program, Florida.* The Program brings together three counties, three major cities, nine smaller cities, an array of regional, state, and federal agencies, and numerous community and environmental groups. The partners signed an agreement to implement a management plan for the estuary that defines the most pressing problems facing the bay today, and presents cost-effective, realistic strategies to address them. For more information, see www.tbep.org.

Training on Demand

Too busy to go back to school or attend training workshops? Many universities and other organizations are now finding ways for you to learn in your spare time — over the Internet. Several universities offer on-line watershed resource training, including the University of Massachusetts Amherst (www.umamherstonline.org) and The Institute of Water Research at Michigan State University (www.iwr.msu.edu/watershed/module-1.html). University on-line courses can be taken for college credit and usually cost about the same as courses taken on campus.

Non-credit training is also available free of cost over the Internet. EPA's Watershed Academy offers a web-based distance learning program called Watershed Academy Web (www.epa.gov/watertrain), a set of free self-paced training modules that provide a basic but broad introduction to the many facets of watershed management. More than 40 modules are now on-line and still more are under development. Students that complete a series of 15 core modules and pass their self-tests earn the Watershed Academy Web Watershed Training Certificate. Similarly, EPA's Office of Ground Water and Drinking Water offers the Drinking Water Academy's Electronic Workshop (www.epa.gov/safewater/dwa/electronic.html), composed of self-paced training modules that give a broad introduction to the many facets of the Safe Drinking Water Act. Interactive exercises and self-tests for the Electronic Workshop are under development.

Maryland Residents Know the Scoop



Do you want to know who's applied for a permit to discharge treated wastewater or emit air pollution in your county? Are you curious about who's been fined for noncompliance with an existing permit or regulation? Maryland residents don't have to look any farther than the *MDEnvironment*, a monthly newspaper published by the Maryland Department of the Environment (MDE). *MDEnvironment* contains summaries of permit applications and permit issuances by county in a For the Record section, descriptions of MDE fines and enforcement actions in an Enforcement & Compliance Notes section, guidance for new regulations, and information about MDE's and other group's environmental activities. "The newsletter is a primary avenue of education and outreach for MDE. We have found that the For the Record and Enforcement & Compliance Notes are the key features in our newspaper that generate public response," explained Richard McIntire, Managing Editor. "People are interested in what is happening in their area."

Now in its fourth year of publication, the free newspaper has a circulation of 8,000 and is accessible over the Internet (www.mde.state.md.us). The public can sign up for a subscription online or by calling the editor.

[For more information, contact Richard McIntire, Managing Editor, 2500 Broening Highway, Baltimore, MD 21224. Phone: (410) 631-3012; E-mail: rmcintire@mde.state.md.us; web site: www.mde.state.md.us.]

Notes on the National Scene

Action Plan Proposes Goal to Reduce Gulf of Mexico Dead Zone

EPA, nine other federal agencies, nine states along the Mississippi River, and two tribes have developed an action plan to reduce the size of the "dead zone," a large, oxygen-starved area of the Gulf of Mexico which threatens the nation's most productive and valuable fishing grounds. The states and federal agencies have agreed to work together to cut the "dead zone" by about half its average size over the next 15 years. (See *News-Notes* #45, #52, #55, #58 for additional articles on the "dead zone" in the Gulf of Mexico.)



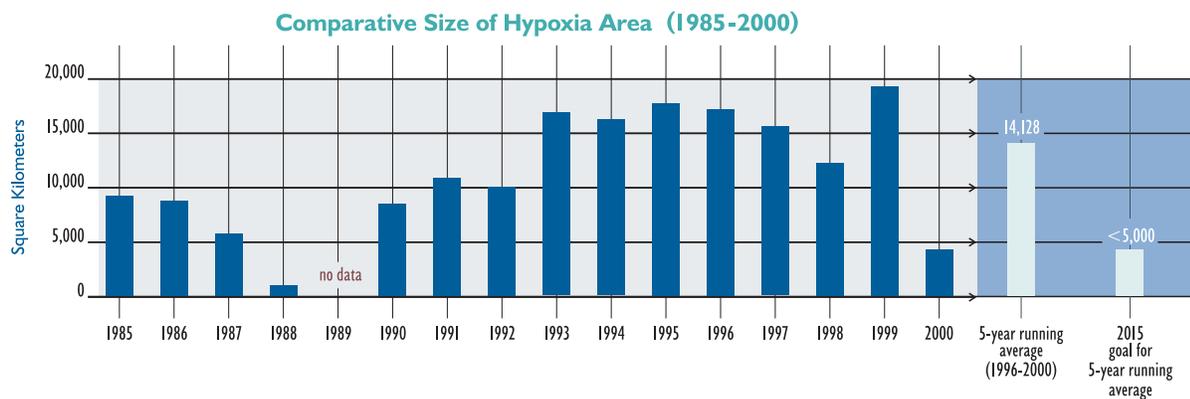
Action Plan
for Reducing, Mitigating, and Controlling Hypoxia
in the Northern Gulf of Mexico

Mississippi River/Gulf of Mexico Watershed Nutrient Task Force
January 2001

The *Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico*, which was released by the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (Task Force) on January 18, 2001, establishes a goal of reducing the size of the so-called "dead zone" by half by 2015. EPA, together with senior representatives from other federal, state, and tribal agencies and organizations, formed the Task Force in December 1997 to study the excessive nutrient runoff to the Mississippi River Basin and to develop a strategy to combat it.

The Task Force also agreed to develop nutrient management strategies which aim for a 30 percent nitrogen reduction to Gulf. The Action Plan calls for continued research and monitoring to better understand this problem and use the information as a basis to modify the goals and actions as may be necessary in the future.

Former EPA Assistant Administrator for Water and Chair of the Task Force J. Charles Fox, said, "This landmark agreement will help protect the Gulf of Mexico. We are



Source: Nancy Rabalais, Louisiana Universities Marine Consortium

especially pleased that all nine states along the Mississippi River have committed to work with the federal government to resolve a national water quality problem.”

Every summer along the Texas-Louisiana portion of the Gulf of Mexico, certain nutrients, especially nitrogen, drain down from the Mississippi River into the Gulf. The excessive nutrients feed algae blooms that deplete oxygen in the Gulf’s deeper waters as they decompose. This area becomes and is referred to as a “dead zone,” because some organisms die while others flee the area. The decrease in oxygen, called hypoxia, affects an area that over the last five years has averaged 14,128 square kilometers (5,454 square miles) off Louisiana’s coast. This area has traditionally been one of the nation’s most productive fisheries. Gulf oxygen levels, which should be about 5 parts per million or higher, have dropped below 2 parts per million in the hypoxic zone and to zero in the dead zone.

A significant portion of the nutrients entering the Gulf from the Mississippi River come from human activities in the 31-state Mississippi River drainage basin: discharges from sewage treatment and industrial wastewater treatment plants and storm water runoff from city streets and farms. Nutrients from automobile exhaust and fossil-fueled power plants also enter the waterways and the Gulf through air deposition to the vast land area drained by the Mississippi River and its tributaries. About 90 percent of the nitrates entering the Gulf come from runoff. About 56 percent of the nitrates enter the Mississippi River above the Ohio River. The Ohio basin adds 34 percent of the nitrates. High nitrogen loads come from basins receiving wastewater discharges and draining agricultural lands in Iowa, Illinois, Indiana, southern Minnesota, and Ohio.

Under the Action Plan, states and tribes, working as river-basin committees, would have flexibility to develop the most effective, practical measures to reduce discharges of nutrients and remove them from their waters. The strategies are expected to rely heavily on voluntary and incentive-based approaches for dealing with agricultural runoff and restoring wetlands. The Action Plan calls for new resources to fund these activities.

[For more information, contact Mary Belefski, U.S. EPA, Office of Water, Mail Code 4503F, 1200 Pennsylvania Avenue, NW, Washington, DC 20460. Phone: (202) 260-7061; e-mail: belefski.mary@epa.gov. The plan and additional information are available on EPA’s web site at: www.epa.gov/msbasin.]

New Landscape Guidelines at Post Offices Under Development

Your local post office soon might look a little different. In previous years, more than 2,000 new post offices were built or rehabilitated each year, allowing the U.S. Postal Service to fulfill its commitment to the environment by implementing environmentally friendly practices. To streamline this effort, the U.S. Postal Service, in cooperation with EPA, is developing beneficial site and landscape guidelines. The guidelines provide information and specifications on how to select and design landscapes to reduce both runoff and maintenance costs, conserve water, and provide wildlife habitat and visual amenities.

“Post offices across the country are already implementing many of these environmentally friendly practices to a certain degree. The Postal Service’s national design specifications, already in place, contain up to 25 percent of the information that is presented in the new guidelines,” explained Sharon Marsh, Environmental Specialist with the Postal Service. “However, the information currently provided is too vague. The people doing the work have told us that they need more suggestions, such as what plants to use and ideas for planning the landscape. We still have some

additional work to do, so we anticipate that the new guidelines will be ready to be formally adopted within the next couple of years.”

The guidelines include detailed engineering and design specifications for site preparation and landscaping. For example, the guidelines explain how architects can control erosion control by analyzing runoff patterns to select site designs and native plant species that reduce erosion and runoff. To help educate contractors, the guidelines offer the latest information on topics such as controlling erosion, planting buffers, using trees for screening, incorporating bioretention areas, and using native plants suited to a particular climate zone. The guidelines also contain suggestions for contractors and maintenance personnel on how to select plants and care for and maintain the new landscape through the first year. Finally, the guidelines contain a beneficial site and landscape assessment checklist to see whether the new landscape meets the Postal Service’s environmental objectives.

Cost Considerations

The Postal Service anticipates that the use of these landscaping guidelines will lower overall project costs over the long term. Site-specific factors, plant type and availability, differences in climate, and varying maintenance and labor costs make it difficult to estimate regional or national costs. Although the initial costs of beneficial landscaping projects can be greater than the costs of using traditional landscaping techniques and materials, the Postal Service predicts that substantial long-term savings will occur due to the use of native perennial plants. Postal facilities can expect cost reductions as a result of increased plant longevity and decreased maintenance costs for fertilizer, water, and labor. To spread out the initial costs, the Postal Service recommends phasing in native plants over a three-year period, rather than replacing the original landscaping plants all at once.

[For more information, contact either Sharon Marsh, Environmental Specialist, U.S. Postal Service Headquarters, 475 L’Enfant Plaza S.W., Room 1P830, Washington, DC 20260-2810. Phone: (202) 268-6486; e-mail: smarsh1@email.usps.gov; or Robert Goo, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, SW, Washington, DC 20046; phone: (202) 260-7025, e-mail: goo.robert@epa.gov.]

Notes from the States, Tribes, and Localities

Bear Creek Project Demonstrates Riparian Benefits

Iowa’s 27-square-mile Bear Creek watershed is now home to one of the longest contiguous riparian research areas in the country. Over the past 10 years, private landowners and Iowa State University’s Department of Forestry have cooperated to restore more than six miles of riparian area in the watershed, five miles of which are contiguous. The riparian project has already improved the health of Bear Creek and is being used as a model for riparian management systems across the Midwest.



The Bear Creek Watershed Project is managed by the Agroecology Issue Team of the Leopold Center for Sustainable Agriculture located at Iowa State University. The team is using the area as a long-term research site, investigating issues such as the success of multi-species riparian buffers, the best types of soil bioengineering and grade control technologies for streambank stabilization, the best types of grazing systems to limit livestock impact to the stream channel, and the use of constructed wetlands to intercept and process nonpoint source pollutants in agricultural drainage tile water. The team is using the lessons learned in Bear Creek to develop a stream restoration approach that is applicable to agricultural watersheds throughout the Midwest.

Private Landowners Hold the Key

The success of the project is largely due to the willingness of private landowners to participate. Twelve landowners along Bear Creek have joined the project since it began in 1990. The first landowner helped get the project started because of an interest in planting trees, shrubs, and grasses on his abandoned riparian pasture. The adjacent landowner was impressed with the results and signed up four years later. Both landowners joined prior to the availability of the Conservation Reserve Program’s (CRP) riparian area enrollment, and therefore participated in the Stewardship Incentive Program which paid for a portion of the planting materials (but does not provide the long-term payments provided by the CRP). Ten other landowners joined the project after CRP went into effect. They currently receive rental payments on their land, in addition to partial

reimbursement for costs of planting materials. The team hopes that non-participating landowners will continue to recognize the benefits on their neighbors' land and eventually offer to take part.

The Buffers are Paying Off

Monitoring data indicate that water quality has improved since the project began, both within the buffer zone and below it. For example, data show that a 66-foot-wide buffer reduces suspended sediment load in runoff by more than 95 percent and nitrogen and phosphorus levels by 70 percent. The removal of pollutants is largely due to trapping of sediment, increased soil infiltration rates, and nutrient uptake by plant roots in the buffer system, explained Dr. Dick Shultz, a member of the Agroecology Issue Team. "We have found dramatic improvements in soil infiltration from rates of 0.5 to 1.5 inches per hour in the crop field to 4 to 5 inches per hour in restored buffers after 6 to 7 years of perennial plant growth. This is because the plant roots in the crop fields are much different than those in the buffer. In the crop field, corn and soybean roots do not penetrate deeply, are not very dense, and decompose rapidly after the growing season. In the buffer, on the other hand, the dense roots of native grasses and forbs grow to depths of 3 to 4 feet," said Shultz. Although not as dense as the native grass roots, the perennial tree roots grow to great depths and strengthen streambanks, reducing streambank erosion. "Overall, probably the most exciting thing for me has been to see how rapidly Mother Nature can heal herself and how effective her living filter is for reducing nonpoint source pollutants," explained Schultz.

The successes are not only in water quality improvement, noted Schultz, "It has also been gratifying to see the joy that the landowners have as they have watched the buffers develop." For example, Schultz related how one landowner is pleased that he no longer gets his tractors stuck in wet areas along the creek or loses crops to flooding as he did when he planted crops right down to the stream edge. Ron Risdal, the first landowner to sign up, explained that "Wildlife is one of the benefits we really enjoy — all the animals and birds. Plus, we don't have gullies washing down into the creek. And, while we don't have income from the buffer now, we could down the road. The trees and switchgrass can be harvested and, of course, both regrow. As far as I am concerned the buffer is here to stay."

Project Support

Over the past 10 years the Agroecology Issue Team has acquired several million dollars for the project from diverse sources, including the Leopold Center for Sustainable Agriculture, USDA, EPA, U.S. Geological Survey, Iowa Department of Natural Resources, Trees Forever, and Pheasants Forever. The team relies on the Conservation Reserve Program to reimburse landowners when they install buffers along the creek. Once the buffers are established, the team turns to grant funds to support the research projects. Current funding from the U.S. Geological Survey supports efforts to model the potential impact of large wetlands on water quality and flood events. In January 2001

Bear Creek Serves as a Model Close to Home and Across the Country

Iowa's Bear Creek riparian buffer project, recognized by the NRCS as one of the finest in the country, has been designated by the USDA as a National Research and Demonstration Site and a prototype for their national buffer strip program (see www.nhq.nrcs.usda.gov/CCS/Buffers.html). The project has been designated as one of 12 National Restoration Demonstration Watersheds by the Clean Water Action Plan.

The Bear Creek project also served as a catalyst for the Iowa Buffer Initiative, a \$1 million-plus effort to promote water quality by using vegetative buffers along waterways throughout the state of Iowa. The Initiative is led by Iowa-based Trees Forever, and is sponsored by Novartis Crop Protection, the Iowa Farm Bureau Federation, Iowa Department of Natural Resources, EPA, NRCS, the Department of Forestry at Iowa State University, and the Leopold Center for Sustainable Agriculture.

Begun in 1998, the Initiative's goal is to create 20 riparian (river or stream) sites across Iowa annually for five years, for a total of 100 sites. The Initiative will also establish technical assistance networks that will support landowners who want to install buffers, help position shelterbelts as buffers around livestock confinement operations, formally recognize landowners who preserve streams and waterways with grass/tree buffers, and use field days to increase awareness among farmers, landowners, and youth about the value of such buffers to sustainable agriculture. The Agroecology Issue Team of the Leopold Center for Sustainable Agriculture has been active in designing these demonstrations and will monitor a subset of these sites to assess the effectiveness of riparian buffers in parts of Iowa outside the Bear Creek watershed.

the Iowa Department of Natural Resources awarded the team a three-year, \$550,000 section 319 grant to support grazing management research in buffer areas.

The team doesn't plan to slow down. The researchers intend to apply to Iowa's new Conservation Reserve Enhancement Program for funds to support development of a series of wetlands to intercept a large agricultural drainage tile that drains about 700 acres of land in the watershed. In most areas, drainage tile is buried underground and drains directly into the creek. The wetland project will investigate the success of treating the drainage water. In the future, the team also plans to help stabilize the channel using boulder weirs to reduce streambank erosion. The team is also actively developing brochures and other publications to educate the public.

Sharing their Knowledge

The researchers' efforts have not gone unnoticed. "We hold at least 30 tours each growing season. Over the past 10 years we've had between 4,000 and 5,000 visitors, representing 30 different countries," noted Schultz. The Agroecology Issue Team is happy to provide tours of the watershed to any interested parties. If even a fraction of these individuals tries to implement similar efforts in their watersheds, the Bear Creek project will have improved water quality around the globe.

As they learn more from the Bear Creek project, researchers will continue to work on developing a comprehensive agricultural watershed management strategy for the midwestern corn belt. In the meantime, the project will serve as a demonstration site for landowners, a demonstration and training site for natural resource managers, and a research site for scientists developing and testing a riparian management system model under real-world conditions.

[For more information contact Richard Schultz, Iowa State University, Department of Forestry, 253 Bessey Hall, Ames, IA 50011. Phone: (515) 294-7602; e-mail: rschultz@iastate.edu; web site: www.buffer.forestry.iastate.edu.]

Georgia Jumps on the Rosgen Restoration Bandwagon:



Why not try something new? That's what the Upper Chattahoochee Riverkeeper, with help from EPA, decided to do when faced with the challenge of reducing erosion and sedimentation in their watershed. The group recently led the first restoration project in Georgia that applied the Rosgen principles of applied geomorphology. These principles look at the existing landscape to help determine how to restore a stream channel so its bankfull dimensions are in equilibrium with its flow regime. The group's efforts paid off — their restoration project successfully stabilized the stream stretch, while also generating unexpected community river stewardship and educational opportunities.

The restored site is located on the Soque River (pronounced So-KEE), in Habersham County in northeastern Georgia. A portion of the upper Soque River flows through the Chattahoochee-Oconee National Forest and is under federal ownership. The remainder of the land is privately owned and supports poultry farms, cattle grazing, and rural residential development. The stream eventually empties into Georgia's Chattahoochee River.

Once well known for trout fishing, the Soque River's health had suffered from poor land-use decisions in the past — such as allowing cattle to have access to the stream, dredging or straightening the channel to make it more uniform, and clearing bank vegetation for aesthetic purposes or to increase pasture land. The sum of these actions made the channel unstable and reduced the stream's capacity to dissipate energy, both of which led to an increase in sediment erosion and transport. As a result, the channel had widened and shallowed, effectively reducing the excellent fish habitat conditions that had once made it famous. In addition, the degraded conditions also raised public health and economic concerns because both the Soque and Chattahoochee rivers serve as municipal water supplies. Since degradation in the Chattahoochee's headwaters only compounds problems downstream, the Soque River was the ideal place to begin.

Tackling the Problem

Luckily, the , a nonprofit organization created in 1994 to protect and improve the Chattahoochee River watershed, was anxious to restore the Chattahoochee's headwater streams. With funding from

EPA through the U.S. Fish and Wildlife Service (FWS) and the Lindhurst Foundation in Chattanooga, in 1996 Riverkeeper began to work closely with Habersham County's Natural Resources Conservation Service (NRCS) to locate riparian landowners who would volunteer to address stream erosion problems on their land. The NRCS connected Riverkeeper with Justin Savage, a landowner whose badly eroding section of stream had prompted him to approach the NRCS for technical assistance with stream management. When the project team analyzed Savage's stream section, they found that a whopping 60 tons of soil eroded over a period of only 2 months. In fact, at one sharp bend the stream was eroding deeply into a pasture, and according to Savage, this area represented an ongoing financial loss that could be measured in "tractor-trailer loads."

A New Approach

Instead of stabilizing Savage's banks by using simple riprap to protect the stream bank, the project team decided to try David Rosgen's holistic stream restoration approach. This approach, which is popular across the country, had never been used before in Georgia. It calls for establishing stable channel geometry for particular stream types as determined by the landscape setting. Unlike the riprap reinforcement, which would protect the project site but transfer erosive potential downstream, the Rosgen technique would stabilize the 1,300 feet of stream bank along Savage's property, adjust the physical stream flow characteristics to the appropriate stage as it flowed downstream, and allow the stream's biological life to rejuvenate.

To implement this technique, the team located a reference stream in a similar geological setting that could be emulated for its profile, dimensions, and sinuosity. Several regional streams were studied for the size of their meanders, the slope of their banks, the gradients of their channels, the size of pebbles on its streambeds, and the spacing of its riffles. In 1997 the team selected Duke's Creek, located in the Smithgall Woods Preserve in White County.

To reduce velocity and absorb stream energy, the stream needed more meanders. Luckily, the team was able to expand the channel into an old farm pond, allowing the stream to have the extra curve and thus a way to dissipate energy. Because the stream was too wide and shallow, the team also reconstructed some banks to narrow the channel. In one rapidly-eroding section of the stream, the team shaped a gentler curve, sloped the banks back, and reinforced the banks with stabilizing rocks and vegetation. The team also placed rockveins and rootwads in the stream to break up the flow, divert energy away from banks, and create fish habitat. Because large earth-moving machinery was involved, the team performed the major restoration work during the dry season when the stream levels were low. They also placed a temporary rockfilter to strain out construction-related sediment that did enter the stream.

Working and Learning

The project generated the interest of citizen volunteers of all kinds, including the local landowners that belonged to the Soque River Watershed Association. Over the next two consecutive winters, they planted native shrubs and trees, placed black willow bundles, and arranged biodegradable mats to stabilize the banks and revegetate the riparian zone. As the work progressed, the site became an education center. Local residents stopping by to check on the progress couldn't help but learn about the restoration techniques used and how a stream should fit into its landscape. One teacher who brought her class to visit the site said, "These are the kids who will be building houses here and living by this river in the future. It is important for them to understand that the things that they do around the river will have an effect on the river."

Other landowners saw the enormous benefits of riparian zone protection and good land use practices. Savage himself reiterated, "Protect the banks at all cost...because once the erosion starts, it's like dominos." Savage's once murky stream stretch is now so vastly improved that he has been able to grant access to the public for fee-based trout fishing. Overall, the project was so successful that his property is being viewed as a model for reducing erosion and preserving water quality in the mountain headwater streams of north Georgia. In fact, FWS refers consultants to the site as they prepare stream mitigation plans under Clean Water Act section 404. The project has also spawned a number of other local projects — ranging from tree planting to bank stabilization to restoration.

Preventing Instead of Restoring

This ambitious restoration project cost approximately \$80,000 and was largely funded by EPA grants. According to project scientist Jennifer Derby, although expensive, the costs will be offset by the benefits of improved fish habitat and lower cleanup costs downstream. To lower costs in the future, she suggested spending time and money on “preventative medicine” — preventing the erosion from starting in the first place. Any dollars spent on prevention would be multiplied many times into savings downstream now and in the future.

[For more information, contact Katherine Baer, Director of Headwaters Conservation, Upper Chattahoochee Riverkeeper, P.O. Box 1720, Gainesville, GA 30503. Phone: (770) 538-2619; web site: www.ucriverkeeper.org.]

Notes on Watershed Management

Issues in Ecology



The Ecological Society of America (ESA), under a cooperative agreement with EPA, recently established a publication series, *Issues in Ecology*, to serve as a resource for citizens, resource managers, policymakers, and others designing and implementing watershed approaches to environmental management. Each *Issues in Ecology* paper is designed to report, in language understandable by non-scientists, the consensus of a panel of scientific experts on issues relevant to the environment. *Issues in Ecology* reports are on the ESA web site (<http://esa.sdsc.edu/issues.htm>) and the EPA Watershed Academy web site (www.epa.gov/watertrain/ecosyst.html); hard copies are \$3 per copy or \$2 for orders of 50 or more.

The following titles are currently available:

Issues in Ecology No. 1 — Human Alteration of the Global Nitrogen Cycle: Causes and Consequences. A panel of scientific experts discusses the causes and consequences of increased nitrogen cycling between the living world and the soil, water, and atmosphere, as well as potential management and policy options to address the problem.

Issues in Ecology No. 2 — Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems. This issue describes the services that natural ecosystems provide, such as seafood, timber, purification of air and water, detoxification and decomposition of wastes, and regulation of climate. These and other services are described in great detail, including potential threats to ecosystem services through land use and other societal decisions.

Issues in Ecology No. 3 — Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen. Experts discuss the sources and consequences of nitrogen and phosphorus pollution and catalog a number of management and policy options for reducing this pollution.

Issues in Ecology No. 4 — Biodiversity and Ecosystem Functioning: Maintaining Natural Life Support Processes. A panel of scientific experts describes the critical links between biodiversity and ecosystem functioning, including the impacts that a loss of biodiversity can have on ecosystem function.

Issues in Ecology No. 5 — Biotic Invasions: Causes, Epidemiology, Global Consequences, and Control. This issue summarizes the ecological knowledge on the process of biological invasions, strategies for identifying potential invaders and vulnerable communities, global change facilitated by biotic invasions, prevention and control, and future research and policy priorities.

Issues in Ecology No. 6 — Applying Ecological Principles to Management of the U.S. National Forests. This paper identifies major ecological considerations that should be incorporated in sound forest management policy and their potential impacts on current practice. The panel also analyzed the ecological assumptions, both explicit and implicit, that underlie a number of current proposals for changes in National Forest management.

Issues in Ecology No. 7 — Nutrient Pollution of Coastal Rivers, Bays, and Seas. Experts explore the causes and results of nutrient pollution in coastal rivers, bays, and seas, and present an array of strategies and approaches to nutrient reduction.

Issues in Ecology No. 8 — Effects of Aquaculture on World Fish Supplies. This issue discusses the effects of aquaculture on world fish supplies, including the impacts of feeding wild-caught fish to farmed fish, the ecological impacts of aquaculture, and suggested steps toward sustainable aquaculture.

Issues in Ecology No. 9 — Water in a Changing World (coming summer 2001). This issue will discuss future prospects for freshwater supply and human and ecosystem demands on it. Topics include the global water cycle (surface and ground water), human appropriation of the global freshwater supply, the water cycle and climate change, emerging problems and implications for research, and current progress and management options.

Ecological Principles for Managing Land Use. In this paper, a panel of experts discusses the key ecological principles for land use and management as they relate to time, species, place, disturbance, and the landscape. Based on these principles, the panel presents several guidelines that serve as practical rules of thumb for incorporating ecological principles into making decisions about the land (<http://esa.sdsc.edu/landuseb.htm> or <http://esa.sdsc.edu/landuseb.pdf>). Hard copies of the report are \$4 per copy or \$2 for orders of 50 or more.

[For more information, or to obtain copies of the documents, contact Lori Hiding, Ecological Society of America, 1707 H Street NW, Washington, DC 20006. Phone: (202) 833-8773; e-mail: lori@esa.org; web site: <http://esa.sdsc.edu>.]

New Vehicle for Watershed Management Takes Off



Michigan State University's (MSU) new cooperative program, Watershed Action through Education and Research (MSU-WATER), brings together participants from six MSU colleges and 16 departments, MSU land management offices, MSU student organizations, and state and local government agencies to address water quality issues on the MSU campus and beyond. Believed to be the first program of its kind, MSU-WATER offers a multi-disciplinary approach to watershed science that incorporates collaborative university research, public education, public service, planning, and BMP implementation on a multi-watershed scale.

The Roots of MSU-WATER

MSU-WATER grew out of a 1998 initiative by the University Committee for a Sustainable Campus to increase awareness of the University's environmental impact, to develop natural resource conservation plans, and to establish MSU as a working model of a sustainable community. Several university faculty working on the committee realized the far-reaching potential of this effort and began a campaign to develop MSU-WATER.

The university's administration also favored the idea. MSU-WATER coordinator Scott Witter notes that the program likely wouldn't exist if it were not for enthusiastic support of the University Provost, Dr. Lou Ann Simon, and MSU Vice President for Finance and Operations Fred Poston. "Our administration is out in the forefront trying to make MSU a cutting-edge watershed research institution," explained Witter. To that end, Simon and Poston earmarked \$1.4 million over four years to support MSU-WATER, beginning in October 2000. State and federal sources have matched MSU's funding with an additional \$700,000 in matching grants.

MSU-WATER Focuses on the Big Picture

MSU-WATER focuses its on-campus work on the Red Cedar River, a small nutrient- and sediment- impaired river that flows through campus. Since the program began, students and faculty have been testing the water quality of the Red Cedar River as it enters and exits the campus to note any changes that result from their on-campus watershed protection. Although they expect their efforts to pay off, Witter doesn't expect to see a marked difference in the water quality leaving the campus. "Most of the pollution seen in the Red Cedar is contributed from the headwaters upstream of campus. We hope to address this problem by reaching out to those headwaters communities via an EPA 319 grant that was awarded in 2000 to Livingston and Ingham Counties in partnership with MSU."

MSU-WATER organizers see the 1999 National Pollutant Discharge Elimination System (NPDES) program's Phase II regulations as an avenue for public outreach and cooperation. The regulations require that operators of Phase II-regulated small municipal separate storm sewer systems and small construction activities apply for NPDES permit coverage and implement storm water discharge management controls.

MSU-WATER cooperators can use their technical expertise and experience to help the regulated communities comply with the new rules. "Michigan has 22 counties and 252 institutions that are going to have to come into compliance with Phase II regulations," explained Witter. "Through MSU-WATER we can fulfill the land grant tradition by serving all of our community's needs." Witter explained that people or organizations have historically been able to turn to a land grant institution, such as MSU, when they needed help with agriculture. Until MSU-WATER was developed, no one was prepared to help them with more holistic issues like watershed management.

Helping Communities On and Off Campus

As part of their research and course work, faculty, students, and local agencies will work with the numerous communities in surrounding watersheds to help them develop watershed management plans. Once the plans are completed, MSU-WATER will assist in the implementation of the BMPs deemed best suited for their storm water control needs.

To introduce the communities to the types of BMPs available, MSU-WATER is implementing BMPs throughout the MSU campus to serve as demonstration projects. "We are in the process of building three different constructed wetlands. We will be able to show visitors what worked for us and what didn't," explained Witter. Faculty and students will study the long-term success of these and other types of BMPs used to reduce or prevent the discharge of pollutants via storm water into receiving waters. "Eventually, we want to be able to tell people which BMPs will give them the biggest bang for their buck."

Helping Others While Helping Themselves

The process of helping surrounding communities tackle their water quality problems creates tremendous multi-disciplinary learning opportunities for MSU undergraduate and graduate students. The MSU-WATER curriculum encourages students to delve deeply into their own disciplines, but requires that they always return to collaborate with other disciplines to solve the problem. For example, as noted above, students will be able to work with communities to help them develop watershed management plans. As part of this process, biology students might identify benthic problems due to sediment influx during bioassessments on the Red Cedar River but not know the cause. Here they learn to collaborate with the resource development and geography students who conduct land-use and personal habit surveys of individuals living upstream of the impaired river segment. Once the sources are identified, the biology, resource development, and geography students work with the soil scientists, geoscientists, and environmental engineers to choose and implement BMPs. For these students, watershed management is no longer an abstract concept — it is reality.

Besides serving as a living classroom for undergraduate and graduate students, Witter hopes MSU-WATER will draw professionals who want to share their expertise and learn new things. "Ideally, we'd like people who work in the watershed management field to spend a year sabbatical with us — learning about our research and helping us work on specific issues. We'd both benefit from the cooperation." As it continues to grow, MSU-WATER will serve as a model for combining community education and outreach with regional watershed planning and implementation.

[For more information, contact Scott G. Witter, Chairperson, Department of Resource Development, Michigan State University, 308 Natural Resource Building, East Lansing, MI, 48824. Phone: (517) 355-3421; e-mail: Witter@pilot.msu.edu.]

Agricultural Notes

Let it Rain on No-till Systems

[Reprinted from the October 2000 issue of *Partners*, published by the Conservation Technology Information Center, West Lafayette, Indiana.]



Few people will stand in a field during an intense rainstorm to view water erosion in process. So Clyde Mermis, district conservationist at Lawrence, Kansas, developed a safe, dry alternative — a portable rainfall simulator. Mermis' homemade model simulates a rainstorm over cropland or construction sites and shows the effects of water running off from exposed and vegetated soil. "With the simulator, we can show that the protective benefits of crop residue are in direct proportion to the level of residue covering the soil surface," says Mermis. "The more crop residue, the less soil loss."

How it Works

Based on a design by Paul , Nebraska Extension engineer, Mermis' simulator showers a 2- to 3-inch rainfall with an oscillating nozzle over five 10" x 20" x 2 1/2" trays of soil with various degrees of residue set at an 11 percent slope. The nozzle creates a droplet close to what occurs in a natural rainstorm. The runoff from a 15-minute rainstorm, collected in clear plastic gallon jugs placed below each tray, shows the positive water quantity and quality benefits of a good crop residue management program.



Mermis' homemade model simulates a rainstorm over cropland or construction sites and shows the effects of water running off the exposed and vegetated soil.

At the end of the demonstration, Mermis turns over the soil trays that have zero percent cover and 100 percent cover. The zero cover tray is wetted only 1 1/2" deep; the bottom of the tray has completely dry dirt. The 100 percent cover tray, however, is completely saturated with water. The runoff-collecting jugs confirm this. A full jug of sediment-loaded water is under the zero cover tray while the 100 percent cover tray has only a small amount of water that is virtually free of any soil sediments.

The Douglas County Conservation District financed the \$800 for simulator building materials. Built by Mermis and conservation technician Alan Gentry, the portable unit includes an 80-gallon water tank with a 5-gallon per minute 12-volt demand pump. The entire simulator fits easily into the back of a pickup truck and can be assembled in less than 20 minutes.

Talk About Soil

While the rainstorm is in progress, Mermis discusses soil quality and soil health. Showing a handful of soil, he explains that the same amount of healthy soil may contain more soil microbes than there are people on earth (6 billion). These soil microbes feed on crop residue and help increase organic matter in the soil. Earthworms also help aerate the soil and improve water filtration, Mermis adds. When cropland is tilled, earthworm and microbe numbers decline and the associated benefits to soil are lost.

Mermis has delivered rainfall simulator demonstrations at grade schools and high schools, field days, and conferences around Kansas. "At every demonstration, I get positive feedback, especially when the crowd includes no-till farmers," Mermis says. "The no-tillers are elbowing the ribs of their conventional-till neighbors and saying, 'See, I told you so.'" Mermis hopes the positive reaction will translate into more and better crop residue management on the land. "That will make a difference for better soil and water quality," he says.

[For more information, contact Clyde Mermis, Natural Resources Conservation Service, 3010 Fourwheel Drive, Suite B, Lawrence, KS 66047. Phone: (785) 843-4288 Ext. 3; e-mail: clyde.mermis@ks.nrcs.usda.gov.]

Want to Learn More about Conservation Tillage?

Farmers have a new resource to turn to with questions about conservation tillage. The second edition of *Conservation Tillage Systems and Management: Crop Residue Management with No-till, Ridge-till, Mulch-till, and Strip-till*, was recently released by the MidWest Plan Service (MWPS), a cooperative regional research and extension organization representing 12 Midwest land-grant universities. The book's 29 chapters address topics such as growing with conservation tillage, conservation tillage equipment, wind and water erosion, crop residue and irrigation water management, water quality, residue management at harvest, estimating residue cover, crop response to tillage systems, and soil compaction. *Conservation Tillage Systems and Management* (document number MWPS-45) is \$25 per single copy, plus \$3.50 postage. To order, call (800) 562-3618, e-mail mwps@iastate.edu, or visit www.mwps.org/catalog.html.

Clay Instead of Pesticides?

No pesticides? No problem for some crops. At least that what researchers at the U.S. Department of Agriculture Agricultural Research Service's Appalachian Fruit Research Station (AFRS) are seeing. They have developed a specially formulated kaolin, a specific type of clay, as a sunburn damage reducer and a replacement for some uses of synthetic pesticides. By reducing the amount of synthetic pesticides applied, kaolin might significantly reduce the amount of pesticides that runs off from orchard land into ground water and surface water.



What is Kaolin?

Kaolin is a white, soft, powdery clay consisting of hydrous aluminum silicate. Deposits occur naturally around the world, and are currently mined in England, Brazil, Australia, the Czech Republic, and the United States. Kaolin is used primarily in the filling and coating of paper, by the ceramic industry, and in rubber to improve its strength and resistance to abrasion. Kaolin is classified as a GRAS (Generally Regarded as Safe) substance by the Federal Drug Administration and can also be found in paints, toothpaste, adhesives, ink, plastics, cosmetics, and other products. Now this versatile, low-toxicity substance has one more use — as a protector against insects and disease.

Kaolin in Orchards

In the early 1990s soil scientist Dr. Michael Glenn of the AFRS became interested in determining if particles could serve as an effective physical barrier to pests and disease. Of all the particle types considered, modified kaolins were the best suited. Since then, the AFRS has collaborated closely with Engelhard Corporation of Iselin, New Jersey, a major manufacturer of kaolin, to develop a patented breakthrough type of particle that doesn't block usable light yet protects the crop from sunburn, insects, and fungal diseases. Engelhard dubbed the resulting porous barrier effect on plant surfaces as "particle film" technology. Unformulated kaolin is ineffective, explains Glenn. "If you dig raw kaolin out of the ground and immediately apply it to plants it would kill them because it blocks light. It would also be impossible to mix and spray and would not evenly coat the plant. By creating certain sizes of kaolin, cleaning them of other minerals and organic substances, shaping the particles, and carefully formulating them with other ingredients, the USDA and Engelhard have developed a usable and highly efficacious particle type." The white particle film material reflects infrared and UV light, which reduces heat stress. "It took us over 10 growing seasons to perfect the particle film," Glenn adds.

Starting in 1999, Engelhard has been marketing the product under the brand name Surround® WP. "Surround crop protectants were applied on over 70,000 acre treatments last season.," says John Mosko, Marketing Manager at Engelhard. "The results were so good in controlling pear psylla on pears and sunburn damage on apples that we expect to at least double its usage in 2001."

Although Surround doesn't work against all insects, USDA Agricultural Research Service and state extension research has shown it to achieve 50 to up to 95 percent control on vulnerable pests. For organic growers, lower control levels are acceptable because it is more effective than other organic

In 1979 AFRS established a 500-acre plot that includes 300 acres planted in apples, peaches, pears, nectarines, plums, apricots, thornless blackberries, blueberries, strawberries, and other fruit crops. AFRS staff work to support, strengthen, and expand the fruit industry of the United States by:

- ✓ Identifying critical problems of temperate fruit production
- ✓ Developing the science, technology, and genetic base needed to maximize productivity and quality of fruit crops
- ✓ Minimizing the adverse effects of biotic and environmental factors on fruit crops

methods. Conventional growers are using it on insects that Surround can control as effectively or better than other alternatives, like pear psylla, leafhoppers/sharshooters, thrips, lacanobia, rose chafer, Japanese beetle, and apple and blueberry maggot. In fact, two of the greatest growth potentials are against thrips on citrus crops and to deter feeding of the glassy winged sharpshooter on conventional and organic grapes that is spreading Pierce's disease in California.

Until recently, kaolin was ineffective at protecting against fungal disease, a common problem in orchards. This changed when AFRS experimented with adding sulfur compounds to Surround to increase the pH. The new mixture successfully suppressed fungus growth in the AFRS orchards better than the sulfur compounds by themselves. Although Engelhard does not plan to change the formula to include the new minerals, lime-sulfur and wettable sulfur can be easily added after Surround in the tank mix.

Saving Money

Although kaolin is usually applied more often than synthetic pesticides, no matter the local climate, it can still be a bargain. "For example, a grower using a common synthetic pesticide to control the psylla insect on pears would apply twice annually at \$80 to 100 per application, plus other pesticides, in a tough psylla area," explained Glenn. "A grower using kaolin in the same area would typically have to apply about four to seven times at up to \$30 per application on large trees. Even when you factor in the added labor costs, the grower still saves money as Surround is taking care of leafhoppers and suppressing codling moth while improving the finish of the pear. For apple sunburn reduction, the payback is terrific. With three sprays, about \$90 worth, proven to cut sunburn damage at least in half, the grower can gain manyfold in yield. For example, if sunburn damage on the unprotected trees is even a modest 10 percent, the 5 percent extra yield can be worth about \$400 to \$500 per acre at \$12 per box and a staggering \$1,300 to \$1,600 per acre at \$40 per box."

What are the Limitations?

The Surround product, listed by the Organic Materials Review Institute in 2000 for organic production, might seem like an organic fruit grower's dream come true. "However, there are admitted limitations for the organic grower as fruit washing is an issue to consider," admits Mosko. Large growers send their fresh market fruit to packers, who use pressure sprays and brushes to remove the kaolin film. However, some small growers don't send their fresh fruit to a packer, and therefore must use an application schedule that will allow the white film to be washed off naturally by harvest. Organic growers that send their fruit for processing or grow roots and tubers can apply Surround to plants until harvest as needed. Very small operations or home growers can also apply until harvest because they can simply hand wash the fruit.

Climate conditions also limit kaolin use. Especially early in the season, kaolin must be reapplied after every significant rain (½ inch or more) because the powdery outer layer gradually washes off. For this reason, kaolin tends to be more economical for growers in drier climates. "In the western U.S., growers typically apply kaolin three to seven times during the growing season. In the eastern U.S., depending on the use, it can be as much as weekly if it is a wet summer. An exception is eastern pears since pears naturally hold Surround on well and the psylla nymphs infest the leaves' underside where Surround is rainfast. Because of the climatic limitations, in the east I expect kaolin to attain widespread use mostly in the organic sector and for particular purposes like Stayman apple cracking reduction, pear psylla, and perhaps blueberries," noted Glenn.

[For more information about efforts, contact D. Michael Glenn, USDA-ARS Appalachian Fruit Research Station, 45 Wiltshire Road, WV 25430-9423. Phone: (304) 725-3451 x 321; fax: (304) 728-2340; e-mail: mglenn@afrs.ars.usda.gov. For more information about Surround@WP, contact John Mosko, Engelhard Corporation, 101 Wood Avenue, Iselin, NJ 08830-0770. Phone: (732) 205-7140; e-mail: John_Mosko@engelhard.co; website: www.surround.engelhard.com.]

Educational Resources Column

Source Water Awareness Tool Kit

The International City/County Management Association, through a grant from EPA, has developed a source water awareness tool kit that can be used to help raise community awareness about drinking water protection issues. The tool kit includes guidelines and sample promotional materials for launching a successful media campaign. The purpose of the guide is to assist small, rural communities develop a media campaign strategy that will increase the awareness of drinking water source protection within their community. The methodology outlined in this guide is based upon the results of a pilot program in Lincoln Parish, Louisiana, where a source water awareness media campaign was conducted in a small, rural community. Other communities may be able to utilize the methods and materials outlined in this guide to increase citizen awareness about drinking water source protection. For more information, contact Dorothy Morrison at dmorrison@icma.org or call (202) 962-3585. The tool kit is available on-line at www.epa.gov/safewater/protect.html.

Looking for Graphics?

Penn State's College of Agricultural Sciences offers a series of graphics for free download on its web site. The graphics are free for public education use in publications, classrooms, and presentations when printed unedited and/or with all Penn State credits in place. Graphic topics include lawn care, tree care, gardening, composting, pest management, health care, and food science. For more information or to download graphics see www.aginfo.psu.edu/psp/index.html.

Pollution Puzzle Makes Learning Fun

Explore the causes of urban runoff in a new educational puzzle developed by the Terrene Institute. The colorful 550-piece puzzle, *Pollution: Begins — And Ends — With You*, is designed after an existing Terrene poster and is made entirely of recycled materials. The finished puzzle is 18 inches by 24 inches — perfect for an evening of fun around the coffee table. For copies of the puzzle, send \$14 plus \$4.50 shipping and handling to: Terrene Institute, 4 Herbert Street, Alexandria, VA 22305. For more information, contact Terrene at (703) 548-5473; e-mail: terrinst@aol.com; web site: www.terrene.org.

Reviews and Announcements

Request for Proposals for the Nutrient Science for Improved Watershed Management Program

As a collaborative, interagency effort, USDA's Cooperative State Research, Education, and Extension Service and EPA's National Center for Environmental Research's Science to Achieve Results (STAR) Program are soliciting proposals for the Nutrient Science for Improved Watershed Management Research Program. The amount of funding support available for this program in FY 2002 is approximately \$7 million (\$4 million from U.S. EPA and \$3 million from USDA). The joint request solicits applications that integrate research and extension activities aimed at addressing nutrient management issues at the watershed scale. For information on eligibility and the complete solicitations, check www.epa.gov/ncerqa in June.

Architectural Copper Runoff Report Released

California's Palo Alto Regional Water Quality Control Plant (RWQCP) recently released *Architectural Uses of Copper: An Evaluation of Storm Water Pollution Loads and BMPs*, a brief report that details the results of a study probing whether architectural copper is a significant contributor to copper loads in storm water. The study found that about 20 percent of the copper loads observed in the local creeks can be traced back to the use of copper in roofs, gutters, downspouts, cupolas, handrails, light fixtures, and signs. Although the study was performed on the 37,800-acre Palo Alto RWQCP service area, the issues discussed are relevant for any locality facing problems with elevated copper levels in local water bodies. The report is available for download at www.westp2net.org/news/cu/copper.htm. For more information, contact Thomas Barron, Civil Engineer, 3351 Beechwood Drive, Lafayette, CA 94549. Phone: (925) 283-8121, e-mail: tsbarron@attglobal.net.

The Clean Water Act TMDL Program: Law, Policy, and Implementation

This 387-page book, published by the Environmental Law Institute (ELI) in 2000, provides a historical overview and outlines future possibilities for the TMDL program. First, the book reviews the history of clean water legislation since 1948, discussing the legislative struggle leading to development of the Clean Water Act Section 303(d), and relating its aftermath in Congress. After introducing Section 303(d), the book relates EPA's early difficulties with its implementation and the litigation that forced the TMDL program forward. Finally, the book explores EPA's subsequent efforts to manage the program and the development of the first state TMDLs. The book concludes with reflections on where the TMDL program has been, where it is going, and its prospects for success. To order, visit ELI's website at www.eli.org or call toll-free (800) 433-5120. The book is available to members for \$33.95 (on-line order sale: \$30.56) and to non-members for \$39.95 (on-line order sale: \$35.96).

Coast Alliance Tackles Polluted Runoff

The nonprofit group Coast Alliance recently released two books addressing nonpoint source pollution. The first, *Mission Possible: State Progress Controlling Runoff under the Coastal Nonpoint Pollution Control Plan* (2000), includes in-depth case studies for five states and short summaries of the remaining states that participate in the Coastal Nonpoint Pollution Control Program. The book identifies innovative approaches to solving runoff problems as well as obstacles encountered by states in doing so. *Mission Possible* is an update to the second book, *Pointless Pollution: Preventing Polluted Runoff and Protecting America's Coast* (1999), which summarizes the impacts of polluted runoff and offers solutions as contained in the Coastal Nonpoint Pollution Control Program. *Pointless Pollution* also provides a state-by-state analysis of the economic value of coastal resources and what states are doing, or not doing, to protect them. Books are \$20 each and can be ordered from the Coast Alliance, 600 Pennsylvania Ave., SE, Suite 340, Washington, D.C. 20003. Phone: (202) 546-9554; e-mail: coast@coastalliance.org; web site: www.coastalliance.org/pubs.htm.

Drinking Water from Forests and Grasslands: A Synthesis of the Scientific Literature

Published by the USDA Forest Service's Southern Research Station in September 2000, this 246-page report (Gen. Tech. Rep. SRS-039) reviews the scientific literature that discusses potential contamination of public drinking water sources by forest and grassland management practices. The report examines how drinking water quality is affected by the management of water, urbanization, recreation, roads, timber, fire, pesticides, grazing, wildlife and fish habitat, and mineral, oil, and gas resources on forest and grasslands. The report is intended to help managers consider contamination risks of drinking water when making land-use decisions. It can be downloaded from www.srs.fs.fed.us/pubs/index.jsp. Readers may also request hard copies of the document via e-mail to pubrequest@srs.fs.usda.gov. For more information, contact the USDA Forest Service, Southern Research Station, P.O. Box 2680, Asheville, NC 28802. Phone: (828) 257-4832.

Finding Farm Niches to Increase Profit

In its recent publication titled *Discovering Profits in Unlikely Places: Agroforestry Opportunities for Added Income*, the University of Minnesota Extension Service is helping farmers find additional income opportunities on their land. This publication investigates the possibilities of increasing income by raising products such as hardwood trees, Christmas trees, landscape plants, herbs, nuts, fruits, berries, and seeds, in addition to regular crops. Rather than replace productive cropland, the publication encourages farmers to plant alternative crops on marginally-productive cropland and in untapped niches such as riparian areas, frequently-flooded bottom land, field borders, center pivot irrigation corners, and grazed woodlots. The 20-page publication can be viewed on-line at www.extension.umn.edu/distribution/naturalresources/DD7407.html or can be ordered for \$2.50 from the University of Minnesota Extension Service at (612) 624-4900 or (800) 876-8636.

Improve the Farm Bill in 2002? Here's How...

The Soil and Water Conservation Society (SWCS), a national nonprofit group that advocates for the conservation profession and for science-based conservation policy, recently released a document summarizing the ideas of 82 state and local leaders for reform of U.S. agricultural conservation policy and programs. The SWCS intends for the 92-page *Reforming the Farm Bill: Ideas from the Grassroots* to help key agricultural and conservation leaders identify changes needed in U.S. agricultural conservation and environmental programs and to help them and policymakers shape proposals to enhance the conservation provisions of the 2002 farm bill. The report is based on recommendations presented at a series of five regional workshops by invited participants representing the agricultural, water quality, and fish and wildlife conservation communities. The document may be downloaded from www.swcs.org (click on the "Seeking Common Ground for Conservation" icon). For more information, contact the SWCS at 7515 Northeast Ankeny Road, Ankeny, IA 50021-9764 or by phone at (800) THE-SOIL.

The Practice of Watershed Protection: Techniques for Protecting and Restoring Urban Watersheds

This comprehensive 800-page volume compiles the best feature articles and technical notes from the past seven years of the Center for Watershed Protection's journal, *Watershed Protection Techniques*, and represents a broad interdisciplinary approach to restoring and maintaining urban watershed health. The book is \$80 (hardcover). For more information, visit .cwp.org or contact the Center for Watershed Protection at 8391 Main Street, Ellicott City, MD 21043. Phone: (410) 461-8323; fax: (410) 461-8324; email: center@cwp.org.

Protocol for Developing Pathogen TMDLs

Published in January 2001 by EPA, this technical document provides guidance for state, interstate, territorial, tribal, local, and federal agency staff involved in development, as well as watershed stakeholders and private consultants. Comments and suggestions from readers are encouraged and will be used to help improve the guidance as EPA continues to build experience and understanding of TMDLs and watershed management. The report (EPA 841-R-00-002) may be downloaded from www.epa.gov/owow/tmdl/techsupp.html. For a free hard copy, contact the National Service Center for Environmental Publications (NSCEP) at (800) 490-9198 or fax (513) 489-8695.

Soil Biology Primer Reissued

The Soil and Water Conservation Society (SWCS) and the Natural Resources Conservation Service (NRCS) have reissued the very popular 48-page *Soil Biology Primer*. Intended for farmers, ranchers, agricultural professionals, resource specialists, conservationists, soil scientists, students, and educators, the *Primer* introduces the living component of soil and how it contributes to agricultural productivity and air and water quality. The *Primer* includes a description of the soil food web and its relationship to soil health, as well as information on about bacteria, fungi, protozoa, nematodes, arthropods, and earthworms. A single copy is \$6 plus shipping & handling (discounts are available for larger orders). For more information, see www.swcs.org/t_pubs_books_primer.htm.

Sprawl Busting

This 376-page book, written by Jerry Weitz and published by the American Planning Association (APA) in 2000, offers a comprehensive overview of growth management efforts over the past 30 years in Florida, Georgia, Oregon, and Washington. The book identifies three principal components of state-sponsored land-use planning: intergovernmental structures, state requirements for local planning, and state support functions such as grants and technical assistance. Because the author compares the structure of programs independent of politics and policy processes, his analyses and observations are applicable elsewhere. The hardcover book is \$48 (\$43 to APA members) from the APA's Planners Book Service by calling (312) 786-6344 or by ordering on-line at www.planning.org/bookstore.

Web Sites Worth a Bookmark

www.epa.gov/OW/pubs/up_index.html

Beginning in January, EPA's Office of Water began posting its "Water Update" quarterly on the Internet. The Update provides regulatory updates and information on upcoming conferences, meetings, training, and publications.

www.groundwater.org/Catalog/catalog.htm

The 2001 Groundwater Foundation's Groundwater Catalog. The updated version of the Groundwater Catalog, now on-line, outlines the groundwater-related science activities, books, music, and other products available from the Groundwater Foundation.

www.smartgrowth.org/information/news/news_trends01-01.html

Smart Growth State by State. This site, updated several times each month by the Smart Growth Network, outlines smart growth activities occurring in states around the country. To update the site the network relies on media reports of planning legislation and executive measures, growth management and coalition-forming efforts, public events, studies and speeches.

www.epa.gov/owow/nps/bestnpsdocs.html

Best Nonpoint Source Documents. EPA's Nonpoint Source Control Branch staff has compiled a partial list of some of the best nonpoint source documents available for both the public and professionals. Each entry includes a short summary and information about how to obtain a copy of the document.

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

June 2001

- 1-2 *2001 New England Chapter-NALMS Conference: Our New England Waters—Shared Lakes, Shared Responsibility: Learning the Causes and Finding the Solutions for Lake Issues and Concerns*, Montpelier, VT. Contact Susan Warren, VT DEC, Water Quality Division, 103 South Main St. Bldg. 10N, Waterbury, VT 05671-0408. Phone: (802) 241-3777; e-mail: susanw@dec.anr.state.vt.us; web site: www.tec-i.com/2001-nec-nalms/conference.htm.
- 3-5 *National Conference on Locally Led Conservation Efforts*, Nebraska City, NE. Contact Arbor Day, phone: (402) 474-5655; e-mail: conferences@arborday.org; web site: www.arborday.org/programs/conferences.html.
- 4-6 *6th Watershed Heroes Field Training Workshop and Conference*, Amana, IA. Contact Jim Porterfield, American Farm Bureau Federation, 225 Touhy Avenue, Park Ridge, IL 60068. Phone: (847) 685-8782; fax: (847) 685-8969; e-mail: jimp@fb.org; web site: www.fb.org/programs/waterheroes.
- 6-8 *Virginia's Sustainable Future II: Solutions for the Environment, Business, and Communities*, Richmond, VA. Contact Convention Connections, Inc. at (804) 360-1500 or e-mail: malloymsm@aol.com.
- 10-15 *5th International Conference on Diffuse Pollution*, Milwaukee, WI. Contact Vladimir Novotny, Institute for Urban Environmental Risk Management, Marquette University, Milwaukee, WI 53201-1881. Phone: (414) 288-3524; fax: (414) 288-7521; e-mail: environment@marquette.edu; web site: www.mu.edu/environment/iwa-page.htm.
- 13-15 *Two Decades of Water Law and Policy Reform: A Retrospective and Agenda for the Future*, Boulder, CO. Contact the Natural Resources Law Center, University of Colorado School of Law, Campus Box 401, Boulder, CO 80309-0401. Phone: (303) 492-1272; fax: (303) 492-1297; e-mail: NRLC@spot.colorado.edu; web site: NRLC@spot.colorado.edu.

24–27 *Third North American Forest Ecology Workshop*, Duluth, MN. Contact Louise Yount, phone: (218) 879-0850 x117; e-mail: lyount@forestry.umn.edu; web site: www.cnr.umn.edu/cfc/outreach/NAFEW/nafew.html.

27–30 *Decision Support System for Water Resources Management*, Snowbird, UT. Contact Mike Kowalski, American Water Resources Association, P.O. Box 1626, Middleburg, VA 20118-1626. Phone: (540) 687-8390; e-mail: mike@awra.org; web site: www.awra.org/meetings/Utah2001.

27–July 1 *National Watershed Forum*, Arlington, VA. Contact Todd Barker, Meridian Institute, (802) 899-2625; e-mail: tbarker@merid.org; web site: www.merid.org.

July 2001

30–Aug 2 *Managing River Flows for Biodiversity: A Conference on Science, Policy, and Conservation Action*, Fort Collins, CO. Contact Nicole Rousemaniere at nrousmaniere@tnc.org or visit the web site at www.freshwaters.org/ccwp/home.html.

August

4–8 *Soil and Water Conservation Society: 2001 Annual Conference*, Myrtle Beach, SC. The conference will focus on how conservation of natural resources is linked to local, regional, national and global concerns. Visit the web site at: <http://swcs.tripod.com/2001agenda.html>.

27–30 *9th National Nonpoint Source Monitoring Workshop: Monitoring and Modeling Nonpoint Source Pollution in the Agricultural Landscape*, Indianapolis, IN. Contact Tammy Taylor, Conservation Technology Information Center, 1220 Potter Drive, Suite 170, West Lafayette, IN 47906. Phone: (765) 494-9555; fax (765) 494-5969; e-mail: taylor@ctic.purdue.edu.

October

3–5 *Addressing Animal Production/Environmental Issues: An International Symposium*, Research Triangle Park, NC. Contact Dr. Leonard S. Bull, Animal and Poultry Waste Management Center, Box 7608, North Carolina State University, Raleigh, NC 27695-7608. Phone: (919) 515-6836; fax: (919) 513-1762; e-mail: Leonard_bull@ncsu.edu; web site: www.cals.ncsu.edu/waste.mgt/sympos/2001.html.

13–17 *WEFTEC 2001. Water Environment Federation's 74th Annual Conference and Exposition*, Atlanta, GA. Contact WEFTEC at (800)666-0206 or e-mail: confinfo@wef.org; web site: www.wef.org.

23–26 *The Association of State Drinking Water Administrators Sixteenth Annual Conference*, Baltimore, MD. Contact ASDWA, 1025 Connecticut Avenue, NW, Suite 903, Washington, DC 20036. Phone: (202) 293-7655; fax: (202) 293-7655; e-mail: asewa@erols.com; web site: www.asdwa.org.

November 2001

7–10 *North American Lake Management Society's 2001 Conference: A Lake Odyssey, Bridging the Gaps Between Science, Policy, and Practice*, Madison, WI. Contact Dr. Richard Lathrop, UW Center for Limnology, 680 N. Park St., Madison, WI 53706. Phone: (608) 261-7593; fax: (608) 265-2340; e-mail: rlathrop@facstaff.wisc.edu; web site: www.nalms.org/symposia/madison.

12-15 *American Water Resources Association's Annual Water Resources Conference*, Albuquerque, NM. Contact Michael E. Campana, Conference Chair, University of New Mexico, Water Resources Program, 1915 Roma NE, Albuquerque, NM 87131-1217. Phone: (505) 277-5249; fax: (505) 277-5226; e-mail: aquadoc@unm.edu.

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 groundwater. 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 31.) 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) 548-5473 or FAX (202) 260-1977.

Nonpoint Source NEWS-NOTES is produced by the Terrene Institute under an EPA Cooperative Agreement (# 820957-01) from the Assessment and Watershed Protection Division, Office of Wetlands, Oceans and Water, U.S. Environmental Protection Agency. It is distributed free of cost. Views expressed do not necessarily reflect those of EPA or the Terrene Institute. Mention of commercial products or publications does not constitute endorsement, or recommendation for use, by EPA or the Terrene Institute.

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c/o Terrene Institute
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Alexandria, VA 22305

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