



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

It's the Right Thing to Do!

By Bill Graves, Governor of Kansas



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.

"It doesn't matter to me whether you're a municipality, whether you're large or small, whether you're Johnson City or Johnson County. It doesn't matter if you're a small business or large industry; it doesn't matter whether you're a small hobby farmer on the weekends or if you're a huge agribusiness operation. It doesn't matter to me whether you're raising cows or pigs or chickens — or building trains, planes, or automobiles — or whether you operate in an urban area, rural area, or suburban setting. Any action that anybody takes in our state that is detrimental to our environment is unacceptable. As Kansans, we need to recognize that our focus is to make sure that our entire state is environmentally safe. Everyone who is engaged in any form of business in our state should be a strong environmental operator.

Our state's Water Quality Initiative is key to this effort. I honestly believe we have to make this voluntary cooperative effort work or we will experience a stronger hand of either state or federal government in protecting our environment — the kind of government intrusion that, quite frankly, most Kansans would prefer not to see.

We are certainly depending on all of you to play leadership roles in ensuring the quality of our environment — the voluntary way. We need your advice, your ideas, your energy

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and commitment to help us move forward. And, as we continue to improve the environment in our state, we need your voices to tell the story around our state and in your communities in an accurate and fair manner. Yes, point out the progress that our state is making with water and environmental issues — but remember the issues we still need to deal with, and to talk about with our friends and neighbors.

We must be willing to do that and face up to the reality of where we are. The Kansas Water Plan maps the road we must take. I fully support the Water Plan, and the necessary improvements in state laws and regulations that can be justified by sound science to improve the environment in our state. I'm going to continue to support water resources as a significant part of Kansans' quality of life. Many people in this state enjoy the great outdoors, and water is a big part of that experience.

You are the leaders who will make our Kansas Water Plan work — not because some bureaucrat tells you to, but because you know it's the right thing to do. And you're willing to do it, and assume the responsibility for leading your friends in voluntarily protecting our environment. I believe that as you share with each other and with all Kansans the critical importance of water to us all, you will put us on the right road to a brighter future for our children and for our state."

This was the challenge I issued November 16, 1999, to the nearly 200 participants in the Governor's Forum on Water Quality Protection in Wichita, Kansas. I charged them to develop recommendations for protecting the quality of the waters in our state. This Forum was the first attempt any state has made to develop an action plan called for by the National Forum on Nonpoint Source Pollution.

Kansas NPS Forum Agenda Loaded with VIPs

Representatives of every group in the state — from publishers to pork producers, CEOs to Girl Scouts—met in Wichita, Kansas, on November 16-17, 1999, to develop voluntary approaches Kansans can take to prevent nonpoint source pollution and protect water quality.

"We're convinced we can achieve voluntary participation rather than more intrusive regulatory compliance to improve the quality of the state's water," said Governor Bill Graves as he convened the first state forum to respond to the National Forum on Nonpoint Source Pollution's call for new strategies to reduce water pollution.

Invited participants met in three facilitated work groups over the 2-day period. Kansas' two CF Industries National Watershed Award winners — Cheney Lake and the Hillsdale Lake Water Quality Project — discussed how to encourage voluntary efforts. G. Tracy Mehan, director of Michigan Department of Environmental Quality's Office of Great Lakes, addressed the opening session, representing Michigan Governor John Engler, co-chair of the National Forum. William Baughman, Vice President for Forestry Operations for Westvaco, addressed the dinner meeting, as did former Kansas Governor Mike Hayden, now CEO of the American Sportfishing Association. Luncheon speakers Jamie Clover-Adams, Kansas Secretary of Agriculture, and Ron Hammerschmidt, Director of the Division of Environment, Kansas Department of Health & Environment, reinforced the dialogues from the work group sessions.

[A Forum report and video will be available this spring from the Kansas Water Office. For more information, contact Al LeDoux, Director, Kansas Water Office, 901 Kansas Avenue, Topeka, KS; (785) 296-3185.]

Our Kansas Forum followed the same structure as the National Forum, assigning participants to three professionally facilitated work groups comprised of very divergent interests and subject to only one rule: no finger-pointing. Each work group worked intensely during the entire Forum, sometimes as a full group, sometimes in smaller units. Themes from the National Forum came up time and again in their deliberations:

- Watersheds as a framework for action
- Prevention of pollution rather than more expensive clean-up
- Commitment over the long haul
- Leadership to make the right partnerships happen.

Although our time frame was much shorter — two days compared to a year for the National Forum — our work groups succeeded in overcoming their often disparate views to come up with 14 specific recommendations for improving and protecting our state waters. Two overriding issues link the 14 recommendations — the need to increase local awareness and the need for local leadership and support.

I am confident that our Water Quality Initiative agencies will make these issues key factors in the plan they are now developing that will summarize current activities related to each of the recommendations and identify actions to implement the recommendations. I also believe that those who participated in our Forum accomplished the one goal of the Forum that will make their recommendations

achievable: they began to build long-term relationships among the great diversity of people who live in our state. Judging from the extensive evaluations returned at the close of the Forum, most agree that the Governor's Forum on Water Quality Protection can become the foundation for building Kansans' efforts to prevent nonpoint source pollution and protect water quality for many years to come.

[The 14 recommendations from the Forum have been published by the Kansas Water Office in the Special Legislative Issue of the Hydrogram. For a free copy, call (888) Kan-Water or e-mail jgotts@kwo.state.ks.us. The Kansas Water Office web site is www.kwo.org.]

Notes on the National Scene

Final Storm Water Phase II Rules Approved; Implementation Scheduled Through 2008



After more than four years of stakeholder meetings and consideration of public comments, EPA is issuing the final version of storm water regulations for small urbanized areas and construction sites covering less than five acres. The Storm Water Phase II Rule, which was signed by EPA Administrator Carol Browner on October 29, 1999, and published in the *Federal Register* on December 8, 1999, will bring municipal separate storm sewer systems (MS4s) serving fewer than 100,000 people and small construction sites into the National Pollutant Discharge Elimination System (NPDES) permitting program by March 2003.

Implementation of municipal storm water programs outlined in the NPDES permits will be phased in by 2008. Phase II small construction site regulations require NPDES permits and compliance with best management practices to minimize pollutant runoff on sites disturbing from one to five acres. Many of these sites are already covered by state or local erosion and sediment control programs, and EPA officials note that most NPDES permitting for construction sites will be handled through general permits that outline pollution prevention strategies and best management practice (BMP) approaches.

Building on the Clean Water Act

Congress required regulations for storm water discharges that affect water quality under the Clean Water Act amendments of 1987. EPA dealt with the largest urbanized areas and large construction sites under the initial phase of the storm water program, adopted in 1990. Phase I required NPDES discharge permits for medium and large MS4s (populations greater than 100,000), 11 categories of industrial sites, and construction activities on five or more acres. The permits could either be tailored to an individual facility and its activities or issued as a general permit covering a whole category of facilities or activities within an individual state.

Individual permits prescribe specific requirements for a particular discharger or group of dischargers and involve facility- and site-specific characterization, management practices, and compliance monitoring. General permits contain a common set of requirements for a wide universe of dischargers, providing guidance and recommended management practices designed to minimize or eliminate water quality degradation. Most of the MS4s and some industrial facilities applied for individual permits; general permits covered most construction sites and the remainder of the industrial facilities. Facilities that have industrial materials or activities that are not exposed to rain and snow are exempt from the regulations, and Congress exempted coverage of all industrial activities operated by small municipalities (populations less than 100,000) until August 7, 2001.

The final Phase II Rule was part of a federal court consent order that settled a 1995 lawsuit filed against EPA by the Natural Resources Defense Council to enforce deadlines in the CWA. The legal action drove EPA's schedule to develop the Phase II Rule. Many cities and towns in urbanized areas have already been addressing polluted runoff through state and local NPS control programs, coastal zone protection efforts, and other clean water initiatives.

Permitting Program Elements

Under the NPDES regulations, an MS4 is defined as “a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)” owned or operated by federal, state, local, or tribal governments. In practical terms, operators of MS4s include municipalities and local sewer districts, state and federal departments of transportation, universities, hospitals, military bases, and correctional facilities. These regulated entities must obtain an NPDES storm water permit and implement pollution prevention plans or management programs specifying BMPs that minimize or prevent the discharge of pollutants into receiving waters.

The particular permit options (individual or general permit) available are subject to the discretion of the NPDES permitting authorities operating in 43 states and the Virgin Islands. EPA estimates that MS4s in 3,700 incorporated jurisdictions and 97,000 construction sites would be subject to regulation in delegated states and territories, with an additional 405 MS4s and 19,000 construction sites regulated directly by EPA in nondelegated jurisdictions (Idaho, New Mexico, Arizona, Alaska, Maine, New Hampshire, Massachusetts, and Puerto Rico).

To facilitate the coordinated development and management of suburban storm water programs, the new Phase II Rule would allow owners/operators of small MS4s to merge their programs with those of adjacent MS4s in cities or other urbanized areas. Jurisdictions wishing to merge their programs with adjacent permitted programs would join as co-permittees upon agreement by all involved parties. Each entity in the consortium would be subject to the permit requirements, but the cooperative, coordinated approach would reduce permit application and reporting tasks and characterization requirements, and make their performance more efficient. The co-permitting provision will provide an attractive option to urban fringe areas, suburban municipalities, and counties, some of which may be split into regulated and unregulated zones under the Phase II program. A whole county will be included in the Phase II program only if all its census blocks meet the urbanized area definition (i.e., densities greater than 1,000 per square mile). If part of a county meets the designation and part does not, only the urbanized part must be included in the program. The same stipulation holds for Indian lands and U.S. territories.

Permits must outline minimum control measures designed to reduce pollutant discharges to the maximum extent practicable and to protect water quality. EPA considers narrative effluent limitations (e.g., no floatables, no visible sheen) and provisions requiring implementation of BMPs vital permit components, according to the *Federal Register* notice published in early December. Control measures include, at a minimum, public education and outreach, public involvement/participation, illicit discharge detection and elimination, construction site storm water runoff control, postconstruction storm water management in new development and redevelopment, and pollution prevention/good housekeeping for municipal operations.

The Construction Industry and Phase II

Phase II targeted construction sites because they significantly impact water quality. Research over the past three decades has found that erosion rates from construction sites are an order of magnitude higher than those measured on row croplands and several orders of magnitude higher than erosion rates on well-vegetated lands. Soil loss from new development can range from 20 to 150 tons per acre, per year; the national average for soil erosion from cropland is about 8 tons per year.

A 1997 study conducted by the Virginia Water Resources Research Center revealed that sedimentation of streams and rivers from road construction in Northern Virginia reduced aquatic insect and fish communities by up to 85 and 40 percent, respectively. Other research in the Patuxent River basin found that 3 to 3.5 miles of stream reaches below construction sites were adversely affected by construction-related sediment loading. Siltation is the second leading cause of impaired water quality in rivers and lakes nationally.

The Phase II Rule requires operators of regulated construction sites where more than one acre is disturbed to obtain an NPDES permit and implement management practices to minimize pollutant runoff, including erosion. NPDES permitting authorities will likely use their existing storm water general permit programs as the operating framework for Phase II programs. For the

most part, these programs consist of a notice of intent that includes general operator and site information, development of a storm water pollution prevention plan specifying BMPs to be employed, and a notice of termination when the site has finally been stabilized. Waivers are available under Phase II for small construction sites (less than 5 acres) in areas with negligible or low predicted rainfall, low predicted soil loss (less than 2 tons/acre/year), or Total Maximum Daily Loads (TMDLs) or comprehensive watershed plans that already address pollutants of concern.

Implementation Schedule

The dates below are approximate. Each NPDES permitting authority will set specific compliance dates as it develops appropriate changes to its existing regulations and issues general permits.

- ✓ **December 8, 1999:** The final Phase II Rule was published in the *Federal Register*, with the Conditional No Exposure Exclusion option available 60 days later for facilities for which EPA is the permitting authority.
- ✓ **October 2000** (1 year from the date of signature of the final rule): EPA must issue a menu of recommended BMPs for regulated small MS4s.
- ✓ **October 2001** (1 year after the issuance of the menu of BMPs): EPA is obligated to issue guidance on the development of measurable goals for regulated small MS4s.
- ✓ **December 8, 2002** (3 years from the date of publication of the final rule): The NPDES permitting authorities must issue general permits for Phase II regulated small MS4s and small (less than 5 acres) construction sites.
- ✓ **March 10, 2003** (3 years and 90 days from the date of publication of the final rule, or by the time specified in the permit): Operators of Phase II regulated small MS4s and small construction activities are required to obtain permit coverage.

By the end of their first permit terms (typically 5 years), operators of regulated small MS4s would have to fully implement their storm water management programs.

A Flexible, Seamless Approach

Current EPA guidance on the Phase II program stresses the incorporation of urban storm water control measures into broader watershed planning and management activities. While the final rule notes the importance of citizen participation and public education in addressing urban runoff, it also outlines the importance of enforceable permits under the NPDES system. The relatively long lead times available for developing the permit application, establishing management practices and control approaches, and implementing the final program allows government jurisdictions more time to develop stronger programs. They will be able to work with local businesses, landowners, developers, and other stakeholders to forge a program that addresses chemical, physical, and biological stressors to the receiving waters.

EPA acknowledges that establishing pollution control programs for Phase II MS4s and construction sites will require extensive financial commitments. The average annual program cost nationally for the Phase II program is estimated at \$55 million, with construction sector costs projected at \$51.2 million and MS4 controls pegged at \$3.8 million.

Development of erosion and sediment control programs for construction sites constitutes the largest expense overall at \$47.4 million. EPA estimates that local government expenses to manage these programs will be less than \$500,000 annually.

The new regulations will result in increase the cost of a new home by about \$500. Erosion and sediment controls for a building lot now account for around 2 percent of the cost of

developing the lot, with another 2 percent devoted to impact analyses, wetland mitigation, and other environmental protection measures, according to the National Association of Home Builders. When home construction costs are added to lot development costs, these measures account for just slightly more than 1 percent of the total price of a new home.

EPA projects that water quality and other benefits from successful implementation of Phase II will fall between \$106 million and \$574 million, with a possible upward benefit range of more than \$3 billion. A considerable portion of the estimate is derived from benefits related to decreased

reservoir sedimentation rates and drainage ditch maintenance. EPA estimates that an average of 820,000 acre-feet of reservoir storage capacity is currently lost to sedimentation and pollution each year.

EPA will provide guidance and other tools to assist MS4s and the construction industry in implementing the Phase II program. "We've been working with the states on the rollout for Phase II," said John Kosco, EPA's Phase II program coordinator. He continued, "There are a number of different activities planned, from 1- and 2-day workshops to web-based training and video teleconferences. We're also developing a 'model' permit so local governments can get a good idea of how to proceed with their applications, and a menu of urban BMPs to consider in local implementation programs."

Regulated Universe

EPA estimates that the potential regulated universe for Phase II includes:

- 5,040 MS4s with a total population of 85 million people and 32.5 million households
- 110,223 construction starts annually
- 76,239 industrial facilities that may be eligible to take advantage of the no exposure provision

[Fact sheets, the full text of the final rule, and other information is available on the EPA storm water web site at www.epa.gov/owm/sw/. Specific elements include a guidance on measurable goals for small MS4s, a menu of BMPs for small MS4s, and a "model" general permit that can be used as a guide by state NPDES permitting authorities. EPA and other partners are developing a training course on the entire NPDES storm water program, and the American Public Works Association has a videotape and training manual available on its web site at www.apwa.net. More information is also available on the web at www.apwa.net/education/workshops/stormwater.htm.]

The requirement for MS4s to meet effluent limitations at the receiving waters discharge point has generated a considerable amount of discussion.

Many have wondered whether permitted entities could require mitigation measures to deal with excessive or polluted runoff from *existing* development through an approach similar to the one used in the current NPDES Pretreatment Program for industrial facilities. However, John Kosco (EPA's Phase II program coordinator) has said, "We [EPA] aren't going to require retrofits for existing development, but there may be cases where the local permit holder — a city or county — might require something on existing development to protect water quality. We won't be involved in those local decisions." Even so, some states have moved aggressively to require runoff controls under their wildlife, flooding, and water quality laws. Others have instituted more stringent requirements through their state Coastal Management Programs.

For example, California is establishing a tiered process for dealing with runoff problems that features voluntary rules initially, then regulations to deal with lingering problems, and enforcement actions to correct remaining water quality violations. The California Water Resources Board unanimously approved the plan on December 14 upon the recommendation of State Resources Secretary Mary Nichols. "Polluted runoff is the major environmental problem we're facing in this state," Nichols said. "This is definitely a step forward." The proposal requires strict monitoring of coastal water quality and calls on state and local governments to aggressively clean up sources of polluted runoff. Actions being studied are development strategies to create catch basins for runoff, improvements to highway drainage systems, and stricter rules for businesses such as restaurants and auto shops. Money for the cleanup is included in Proposition 13, an environmental initiative on the March 2000 ballot.

Increased 319 Funding for Tribes and Lakes in FY00



On October 20, 1999, the President signed the FY00 appropriations bill for EPA, which once again included \$200 million for states, territories, and tribes to implement their nonpoint source management programs under Clean Water Act section 319. This year, however, states will see a few changes in the way section 319 funds are allocated and used, particularly with respect to tribes and Clean Lakes activities. These changes are outlined in EPA's *Supplemental Guidance for the Award of Section 319 Nonpoint Source Grants in FY 2000*, which is available on the Internet at www.epa.gov/owow/nps.

First, for this year only, Congress has lifted the cap on the amount tribes are allotted in FY00 for implementing nonpoint source programs on their lands. This year tribes will receive 1.25 percent of the \$200 million, or \$2.5 million. This figure is up from the 0.333 percent, or \$0.67 million, they received last year. Each state will see only a small reduction in the amount they receive.

Second, fulfilling a suggestion put forth by the Senate Appropriations Committee, EPA has developed a new guidance document entitled *Supplemental Guidance for the Award of Section 319 Nonpoint Source Grants in FY 2000*, that encourages states to use section 319 funds for Clean Lake program activities. In the past, states' Clean Lakes program activities (management of lakes, ponds, and reservoirs) were funded by the Clean Lakes Program under section 314 of the Clean Water Act. Since section 314 funding was eliminated in 1994, EPA has encouraged states and tribes to use a portion of their section 319 funds instead.

In response to concerns that lakes and reservoirs need more funds, this year the Senate Appropriations Committee directed that "Clean Lakes activities are to be funded through the section 319 nonpoint source grant program. The Committee suggests that five percent of the section 319 funds be allocated to Clean Lakes, and that EPA better integrate the Clean Lakes and section 319 programs by incorporating the section 314 guidance into the 319 guidance."

EPA has incorporated the Appropriation Committee's suggestion and issued new guidance that suggests "each state use at least five percent of its section 319 funds for Clean Lakes activities to address the restoration and protection needs of priority lakes, ponds, and reservoirs." EPA request that states give priority to funding the following eligible Clean Lakes activities: Lake Water Quality Assessment Projects, Phase 1 Diagnostic/Feasibility Studies, Phase 2 Restoration/Implementation

Projects, and Phase 3 Post-Restoration Monitoring Studies. The guidance further points out that Clean Lakes activities must be consistent with various aspects of the Clean Lakes regulations (40 CFR 35.1605-3) and must be included and treated as part of the state's section 319 work program. Finally, the guidance includes new data elements for Clean Lakes activities for the Grants Reporting and Tracking System to enable EPA and states to track progress in responding to the Senate Appropriation Committee's suggestion.

Other issues discussed in the *Supplemental Guidance* include:

- Using section 319 funds to support the EPA/U.S. Department of Agriculture's 1999 *Unified Animal Feeding Operation Strategy*.
- Using incremental 319 dollars for development and implementation of watershed restoration action strategies.
- Prioritizing rivers designated as "American Heritage Rivers."
- Improving the tracking and reporting process.

In a memo to EPA regions and states regarding the new guidance, Robert Wayland, Director of EPA's Office of Wetlands, Oceans, and Watersheds, was very optimistic about the future of the nation's lakes and other waterbodies, saying, "When we look at how much progress has been achieved by states and their partners during the past 10 years, there is much to be proud of. I believe that with states' renewed focus on solving priority problems with a broad array of effective technical, programmatic, and regulatory tools, our accomplishments will accelerate during the next 10 years and result in the restoration of many of our currently impaired waterbodies, while protecting those that may be threatened. This is indeed an exciting time for all of us who are working to protect our nation's waters."

[For more information, please contact Dov Weitman, Chief, Nonpoint Source Control Branch (4503F), Office of Water, U.S. Environmental Protection Agency, Ariel Rios Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460. Phone: (202) 260-7100; e-mail: weitman.dov@epa.gov. Additional Clean Lakes information is available on the web at www.epa.gov/owow/lakes.]

Stream Corridor Restoration Project Showcased on EPA Web Site

Among the many assignments to federal agencies under President Clinton's *Clean Water Action Plan* was the direction to "... showcase the application of stream corridor restoration technology in 12 demonstration project areas for water quality improvement." Nominations for showcasing were accepted during 1998, final selections were made in early 1999, and now a new web site spotlights the hard work that the selected project teams have undertaken. The 12 sites were selected for their ability to showcase the application of stream corridor restoration technology and for improving the community, the environment, and water quality as endorsed in the *Clean Water Action Plan*.

The showcased watershed projects are:

- Duck Creek Watershed (Alaska)
- Big Nance Creek Watershed (Alabama)
- Gila River Corridor Recovery Project (Arizona and New Mexico)
- Suwanee River Watershed (Georgia/Florida)
- Bear Creek Watershed (Iowa)
- Sun River Basin (Montana)
- Blackfoot Watershed (Montana)
- Carson River Watershed (Nevada)
- McCoy Creek Watershed (Oregon)
- Lititz Run Watershed Alliance (Pennsylvania)
- White River Partnership Watershed Restoration Project (Vermont)
- Duwamish-Green River Watershed (Washington)

The selected projects represent a variety of geographic locations and conditions; a balance of management and design; strong local, tribal, and state leadership; public and private land use mix;



and partnerships in stream corridor restoration. The web site celebrates these successful projects as examples of accomplishments through restoration. It provides information such as location, partners, scheduled events, contact information, and other links for each showcased watershed. Also available is a 12-month calendar featuring a description and photo of each of the 12 watersheds.

[For more information, visit the National Showcase Watershed web site at www.epa.gov/owow/showcase.]

National Showcase Watershed Partners

U.S. Environmental Protection Agency
Natural Resources Conservation Service
U.S. Department of Agriculture
USDA Forest Service
Bureau of Land Management
U.S. Army Corps of Engineers
Bureau of Reclamation
U.S. Fish and Wildlife Service
Tennessee Valley Authority
National Oceanic and Atmospheric
Administration

News from the States, Tribes, and Localities

Chicago Beats the Heat with Green Techniques

The city of Chicago is reducing storm water runoff as a side benefit of “beating the heat.” Chicago’s Department of the Environment (DOE) is implementing the Urban Heat Island Reduction Initiative, aimed at reducing urban air temperature and consequent energy consumption, improving air quality, and beautifying downtown Chicago. The city is doing this primarily by installing light-colored rooftops, creating rooftop gardens, planting trees where none exist, and breaking up asphalt to install porous pavement or plant trees and shrubs. Although not the primary goal, most of these practices reduce storm water runoff. They also improve the quality of the runoff that does occur.

Project Scope

Chicago’s Initiative, funded by a large settlement with the local utility company over multiple power outages in the city during peak demand, began in 1999 with a large demonstration rooftop garden project on the roof of City Hall. The city is also demonstrating porous pavement installation and asphalt planting islands — areas where pavement has been removed to plant “islands” of vegetation to break up what otherwise would be a large expanse of asphalt — on public land — in four areas of the city. Part of the settlement fund will also be used for a grant program to pay private city landowners to install similar practices. The city plans to focus initially on greening the city at visible locations like City Hall and on gateways such as rooftops along the elevated train tracks — places where people moving into or around the city can enjoy the green areas. “We’d like to introduce people to the city that way,” explained Jessica Rio, DOE spokesperson. This greening will also reduce the load on the local utility; resulting in fewer power outages.

Currently only the city’s demonstration projects have begun. Rooftop garden beds are being built (see box), and the beds will be planted in May 2000. Grant applications for private projects are being accepted on an ongoing basis and are still under review. The city hopes to use its demonstration projects and associated media attention to educate city landowners about the heat island effect and encourage many to begin their own projects.

The amount the city will pay for installation of greening techniques will depend largely on the size and type of the project. Typically, landowners will be responsible for the basic cost of installing a regular roof or pouring asphalt or concrete. The city will pay for the extra cost involved in installing a rooftop garden (usually an extra \$2 to \$4 more per square foot) or installing porous pavement (can range from \$2 to \$7 more per square foot, depending on type).

Rooftop Gardens — a Greening Technique

The rooftop garden on City Hall is ideal for conducting research and encouraging community involvement. City Hall and the adjacent County Hall are mirror-image buildings, built like two horseshoes facing inward with a courtyard in the middle. Because the two buildings are identical, County Hall will serve as the control roof, providing an example of the classic black tar roof that is

seen on so many city buildings. Many taller buildings surround the site, making the project visible to many in the city. Weather centers on both the City Hall and County Hall rooftops have been gathering baseline data on temperature, wind, and rainfall since summer 1999. Local high school students will help monitor the weather centers and use the data for classroom projects.

Planning the Rooftop Garden

Despite what most people think, a rooftop garden does not have to be extremely heavy and require extra structural support. At City Hall, Jessica Rio noted, "the majority of the rooftop will be ground cover with relatively little soil, weighing only 20 to 34 pounds per square foot." City Hall's roof will be covered with drought-tolerant plants such as buffalo grass and common blue violet. Most rooftop gardens, including the one on City Hall, will also include islands of semi-intensive plants (see figure below) such as junipers that require 6 to 8 inches of soil, weighing 50 to 90 pounds per square foot. City Hall's landscape plan also includes vines such as American bittersweet, which will climb up the walls of the different levels of the roof.

Preparing a Roof for a Garden

Chicago is replacing the old City Hall roof with a new roof designed specifically for a rooftop garden. The roof includes the following layers, from the top down:

- Gravel (walkways)
- Growing medium (4 to 8 inches thick, depending on planting intensity)
- Filter material
- Drainage layer (1 to 6 inches thick, depending on planting intensity)
- Root protection material
- Protection/separation material
- Waterproof membrane for roof
- Insulation layer
- Existing roof

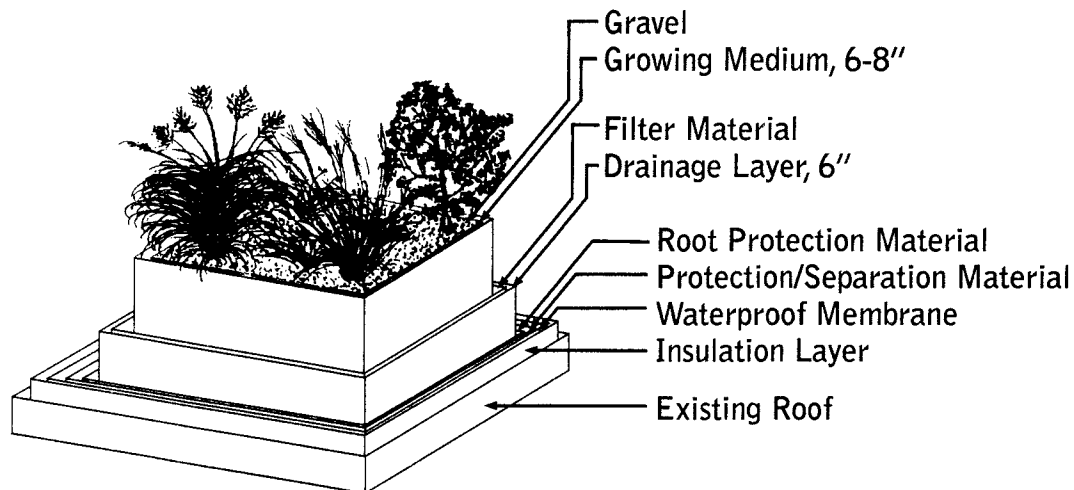
At potential project sites where a new roof has recently been installed, options such as planters and roll-out ground cover growing mats are also available.

Gardens on rooftops with adequate structural support can also include trees in large containers. The adequacy of structural support is not an issue for the City Hall building rooftop garden because the original building plans called for another floor that was never built. Taking advantage of this added support, the city will plant trees such as Washington hawthorne and prairie crabapple in two large containers requiring 30 inches of soil each and weighing 80 to 200 pounds per square foot.

Storm Water Savings

Plants will be installed on approximately half, or 20,000 square feet, of the City Hall roof. Kimberly Worthington, DOE Engineer, notes that City Hall's rooftop garden "will capture and filter up to a 1-inch rainfall." Additional rainfall will drain off the roof into the sewer system.

Chicago has a combined sewer system, treating both wastewater and storm water during a storm event. For now, the city's few demonstration projects will not have a noticeable impact. "However," explains Worthington, "if we begin to do several projects around the city, we will see some impact. When taken collectively, these projects will reduce loading on the sewer system. If we can reduce the impact, maybe we can increase the infrastructure's life." Several demonstration projects are planned at public facilities around Chicago. In addition, DOE will soon provide grants to landowners who wish to implement heat-reducing projects.



Semi-Intensive Roof System

The city of Chicago will see numerous benefits from its greening projects. Not only will the projects reduce summertime air temperature, reduce electricity bills, and improve air quality, but they will also reduce and improve the quality of storm water runoff and improve the aesthetics of the city. Chicago serves as a model of what can be implemented in urban areas to beat the heat and green the streets.

[For more information, contact Chicago Department of the Environment, 25th Floor, 30 North LaSalle Street, Chicago, IL 60602-2575. Phone: (312) 744-5716. E-mail: environment@ci.chi.il.us]

New Green Mortgages Protect the Environment and Save Homeowners Money

Buying a home can be very exciting, but Fannie Mae, the nation's largest source of financing for home mortgages, the Colorado Association of Home Builders (CAHB), and the "Built Green" Program of Colorado have found a way to make it even more exciting. The three are working together to encourage more resource-efficient construction through a new mortgage that allows lenders to use the estimated energy and water monthly savings derived from resource-efficient homes in qualifying borrowers for additional funds.

Homebuyers in Colorado buying homes that qualify for Colorado's "green building" program, dubbed Built Green Colorado, will be eligible for the new mortgage pilot program. Built Green homes are more affordable because of lower operating costs and high performance, and they can offer buyers greater comfort and reduced maintenance costs. The homes range in price from just over \$100,000 to more than \$1 million. So far, two lenders are participating in the new pilot — GMAC Mortgage and First Colorado Mortgage.

In a press release from Fannie Mae, Tony Hernandez, Fannie Mae's Colorado Partnership Office Director, stated, "Our goal is to help the consumer capture the benefits of environmentally responsible construction — including lower operating costs, reduced maintenance, and increased durability. With this mortgage pilot tied to the Built Green Program, more consumers can purchase such a home and reduce their monthly utility expenses." As part of the project, Fannie Mae has issued a statement to lenders and appraisers letting them know that the value of energy- and resource-efficient improvements in homes can be acknowledged in the appraisal process.

Nationally, Fannie Mae has committed to invest \$100 million in environmental initiatives that test new housing finance products, support local green builder efforts, and develop creative solutions to environmental issues with community partners all over the country, including pilot green mortgage programs in five other cities — Atlanta, Georgia; Columbus, Ohio; Albuquerque, New Mexico; Los Angeles, California; and Seattle, Washington.

"Lenders, appraisers, and investors need to recognize the enhanced value in housing that comes from environmentally efficient building practices so that buyers are given credit, for example, for reduced energy expenses," added National Association of Home Builders (NAHB) President Charlie Ruma. "Financing that provides incentives for buyers, builders, and lenders to practice green building is the next step in the green building arena."

Built Green was founded in 1996 by several agencies and groups led by the Home Builders Association of Metropolitan Denver. The program's mission is to make energy- and resource-efficient communities the standard in Colorado. The Governor's Office of Energy Conservation funds the program and the Home Builders Association of Metropolitan Denver (HBA) administers the program. Currently, more than 100 builders are on board and 3,500 Built Green homes had been constructed by the end of 1999.

The Built Green program registers individual homes that have received a 4-star energy rating from E-Star Colorado (an energy efficiency evaluation company) or that were built according to energy saving standards set by the Council of American Building Officials (CABO). There are 138 separate features in 21 categories in the Built Green Checklist. A builder must choose at least

35 features if all categories are used, or 38 features if one or more categories are skipped, to qualify the home as "Built Green." Categories of activities or practices on the checklist include energy requirements, land use, waste management, and water conservation/pollution prevention. Under the water conservation/pollution prevention category, builders must choose to implement one of the following options:

- Use at least 40 percent permeable material for all walkways, patios, and driveways
- Plant grass that uses less water such as blue gramma or fescue in turf areas
- Xeriscape more than 60 percent of nonpaved areas
- Recover rainwater from roofs for watering
- Xeriscape with drought-resistant plants and/or grasses
- Provide a list of native drought-resistant plant to homebuyers
- Install low-flow faucets in bathrooms, installed to manufacturer's specifications.
- Install low-flow faucets in kitchen, installed to manufacturer's specifications
- Install front-loading, horizontal-axis, or its equivalent, clothes washer
- Install passive or on-demand hot water delivery system at the farthest location from water heater.

Second Annual National Green Builder Conference

**April 5-8, 2000
Adams Mark Hotel
Denver, CO**

The Second Annual National Green Builder conference will focus on residential design, development, marketing, building, and financing of homes that are environmentally sensible. It will feature general and concurrent sessions, exhibits, and tours of Denver's Built Green homes.

To register, contact NAHB Research Center, 400 Prince George's Blvd., Upper Marlboro, MD 20774-88731. Phone: (800) 638-8556; web site: www.nahbrc.org.

To provide quality control, 5 percent of all homes built under the program are inspected for compliance by E-Star Home Energy Ratings. Homebuyers are provided with a personalized Built Green certificate. Builders enroll for an annual cost of \$150 and pay a fee of either \$20 per home in single-builder communities or \$50 for single homes, which includes a yard sign with the Built Green logo. Sponsors, companies whose products or services comply with one or more of the criteria on the checklist, pay \$500 to join the program.

"Green building programs are popping up all over," said Doug Seiter, Green Builder Program State Coordinator, "but there are currently fewer than 20 that have made any significant impact." He hopes that as more people move into these homes, the news of monthly savings will spread by word of mouth from neighbor to neighbor, eventually increasing the demand for the green homes.

McStain Enterprises, a respected builder in the Denver area for more than 30 years, has taken the lead in green building. In fact, since 1997

McStain has been building homes to green standards that exceed the minimum points established by the Built Green program. So far they have sold approximately 750 Built Green homes; 230 of them in 1999. Not only is McStain successful at selling homes, they also successfully protect water quality in the Denver area. "We encourage xeriscape in community common areas and include information on xeriscape in our Homeowners' Manual," explained Kristen Shewfelt, Director of McStain's Environmental Programs. Not only does xeriscaping reduce water consumption and landscape maintenance, it also helps reduce the use of fertilizers and pesticides. McStain will also soon begin a wetland restoration project in Loveland, Colorado, to restore wildlife habitat and improve water quality.

"Responsible home builders can benefit substantially from building and promoting Built Green homes," say John Kurowski, President of Kurowski Development Company, a leader for 25 years in the green building movement in Colorado. Now, with Fannie Mae's new green mortgages, home *buyers* benefit as well.

[For more information, contact Doug Seiter, Green Builder Program State Coordinator, c/o Planit Green, 11960 West 60th Avenue, Arvada, CO 80004-4463. Phone: (303) 421-4889; fax: (303) 421-4889; e-mail: dougseiter@earthlink.net. Visit the Built Green web site at www.builtgreen.org. For more information about buying a Built Green home in Colorado, contact Fannie Mae's Consumer Resource Center at 1-800-7-FANNIE.]

Notes on Watershed Management

Watershed Heroes to the Rescue!



If you were to ask Sherman Lundy, a high school chemistry teacher in Burlington, Iowa, to describe himself in one word, he probably wouldn't pick the word "hero." That's because when people think of heroes they usually imagine someone in a cape flying around saving people from danger. But there's a new group of heroes made up of people like Lundy from all over the country, and for the last four years the Watershed Heroes Conference in Amana, Iowa, has brought these unsung heroes together to learn new ways to protect water quality.

In 1996 Lundy was one of 75 people who took part in the first Watershed Heroes Conference sponsored by the American Farm Bureau Federation (AFBF). Each June the conference brings together AFBF staff, state agricultural agency personnel, farmers, municipal water suppliers, local community leaders, teachers, and others to educate them on the latest information related to pesticide and nutrient impacts on human health, water quality, and soil biology. According to Jim Porterfield, AFBF's Watershed Heroes Conference Coordinator, "the goal is to solve problems in watersheds together so that farmers make money both immediately and in the long term." Attendees spend four days learning about factors that influence a watershed, such as tillage, soil structure, how fertilizer and chemicals move with soil and water, new nutrient management techniques and technologies, and even how earthworms influence the soil's water-holding capacity.

The conference is not your typical listen-to-lectures conference. It is unique for several reasons. First and foremost are the teams created. AFBF organizes all the conference participants into small teams (six or seven people) charged with making some management decisions on a plot of corn and a plot of soybeans (30 feet wide by 580 feet long) and following it through to harvest. AFBF tries to mix water producers (farmers who own and operate the land that rain falls on) with water consumers (water utility operators, wastewater treatment plant operators) on each team. The teams decide how much fertilizer, pesticides, or other chemicals to apply according to the soil conditions, rainfall, and other factors and relay their decisions through AFBF to the staff at Amana Society Farms to implement. Teams can request herbicides at different rates and times, chose no-till or disk and field cultivation, and select different nitrogen rates. Each field also has a control section where no chemicals are applied. The goal is to get the most profitable harvest while at the same time reducing the crops' impact on the environment. Newsletter updates help the teams follow their field plots for many months, turning the four-day conference into a 10-month affair.

Second, the conference is unique in terms of the number of hands-on field activities during the conference. Team members are encouraged to actually go out into the field and test and measure for nitrogen, infiltration, soil compaction, crop residue cover, weed growth, and soil erosion.

Finally, and perhaps most importantly from the point of view of the participants, is the fact that part of each team member's registration fee is put into an escrow account to guarantee Amana Farms that they will not lose any money for having implemented the experiments requested by the teams. Because each team member has "ownership" of the plots (i.e., puts real money at risk), participants walk away with a greater sense of real-world applicability.

Each year a new crop of heroes take what they have learned at the conference back to their hometowns and begin to use that knowledge to solve real water quality problems in their regions. Lundy became interested in the conference after a group of student "investigators" from his advanced placement chemistry class found high levels of fecal coliforms in Flint Creek, a small creek that flows through the city of Burlington. His students sparked the creation of the Flint Creek Advisory Board (FCAB), consisting of approximately 15 stakeholders representing farm and commodity groups, citizens, and supervisors. Lundy's students, trained in water quality and habitat testing techniques, collected data from the creek over a six-year period and presented it to the FCAB. One member of the board who is also a member of the local Farm Bureau, suggested that representatives from the board participate in the Watershed Heroes Conference to learn what could be done to heal the degraded creek.

Lundy and three other members of the FCAB participated in the conference and were astounded at the wealth of knowledge they found there. "I was really impressed with the caliber of the presentations at the conference. It was a very well directed and highly informative experience," says Lundy. In fact, according to Lundy, his team was so impressed with the conference's riparian buffer demonstration, "we decided that buffers were the way to go to improve the quality of the water in our creek." He continued, "grasses can be plowed up if the landowner decides to change agricultural habits while trees are much more permanent features with better root systems for runoff control and bank stabilization." FCAB now works with the NRCS, Geode RCD, a nonprofit group, and many volunteers to plant trees that act as buffers along the banks of Flint Creek twice a year. Last summer, more than 75 volunteers planted 11,000 trees and it seems to be working. In areas where the most trees have been planted, fecal coliform levels have dropped. Funding for the project comes from three sources — an EPA section 319 grant, USDA's Conservation Reserve Program, and landowner matching funds.

Sheila Ehrich, a corn and soybean farmer in Faribault, Minnesota, couldn't say enough good things about her experiences with the conference. "The conference taught me practical, down-to-earth techniques that I could take home and use on my 1,000-acre farm," said Ehrich. "I needed to know how to figure out how much crop residue to leave after harvest, and they took us out in the field with a 100-foot tape measure and showed us how."

Participants also receive integrated pest management (IPM) scouting reports from Amana during the growing season, results of a late spring nitrogen test and fall stalk test, a videotape of the plots being harvested (showing real-time yield), and a full financial analysis of all the plots.

[If you are interested in participating on a team at the next Watershed Heroes Conference on June 5-7, 2000, in Amana, Iowa, contact Jim Porterfield, Technical Specialist, Land, Water, and Forestry Resources, American Farm Bureau Federation, 225 Touhy Avenue, Park Ridge, IL 60068. Phone: (847) 685-8782; fax: (847) 685-8969; e-mail: jimp@fb.com. Visit the conference web site at www.fb.com/connect/watershed.]

1999 National Watershed Awards Spotlight Outstanding Volunteer Projects

What do three watershed programs have in common with the Dow Chemical Company? Not much, except the fact that they all won the prestigious 1999 CF Industries National Watershed Award. Each year, CF Industries, one of North America's largest interregional cooperatives, recognizes one corporation and three communities nationwide for their outstanding cross-sector partnership efforts to protect the country's watersheds. The awards are administered by The Conservation Fund, a national, nonprofit organization dedicated to protecting America's legacy of land and water by using innovative conservation techniques, education, and community-based activities. All four winners this year have programs or projects that hinge on voluntary partnerships forged to protect water quality.

Sun River Watershed Project

It took five long years, but the Sun River Watershed team in Montana finally began to reverse the damage caused by 30 years of careless disregard of the area's water resources. Years of irrigation, overgrazing, and the growth of nonnative weeds had taken a toll on Muddy Creek. After a much-needed stakeholder meeting that included landowners, the irrigation districts, townspeople, the counties and communities, conservationists, and environmentalists, the Sun River Watershed team began working with the Bureau of Reclamation, the local irrigation district, and other groups in a public/private partnership to restore the river and its tributaries. So far, the team has reduced erosion by 75 percent (from 200,000 tons of sediment annually to below 50,000 tons), restored 21,000 feet of stream bank and fish habitat on the Sun River and its tributaries, released thousands of insects to control noxious weeds, improved irrigation efficiency and decreased water consumption through the use of irrigation weather stations and automated canal gates, and implemented grazing management on 50,000 acres of rangeland. In fact, irrigation return flows into Muddy Creek have been reduced by approximately 50 percent — from almost 600 cubic feet per second (cfs) down to approximately 300 cfs.

For more information, contact Alan Rollo, Watershed Coordinator, Sun River Watershed, 12 Third Street, NW, Great Falls, MT 59404. Phone: (406) 727-4437; e-mail: arollo@mcr.net.

North Branch of the Chicago River Demonstration Project

Through the North Branch of the Chicago River Demonstration Project, the Friends of the Chicago River and the Lake County Stormwater Management Commission joined to develop a plan to address NPS pollution and flooding while educating and involving citizens and community leaders in the process. The result was an urban watershed planning model that any city can use to protect its water resources.

This 96-square-mile watershed was affected by storm water runoff from two counties and 24 towns. The partners in the North Branch of the Chicago River Demonstration Project divided the project into four tasks — developing a watershed plan, conducting an information and education campaign, developing a handbook to guide them through the process, and conducting a series of demonstration projects.

For more information, contact David Ramsay, Friends of the Chicago River, 407 South Dearborn, Suite 1580, Chicago, IL 60605. Phone: (312) 939-0409, ext. 21; e-mail: dramsay@chicagoriver.org.

Friends of the Rappahannock

A group of forward-thinking residents in Virginia's Rappahannock watershed organized themselves into the Friends of the Rappahannock (FOR) to combat the river's problems — sediments, nutrients, and other pollutants from development and agriculture, and a dam that blocked fish passage to spawning waters. As FOR, these determined citizens got the river designated a State Scenic River, set up a citizen water quality monitoring program, constructed several wetland biofilters to treat parking lot runoff, produced a green guidebook for developers and builders, and spurred the removal of a 150-year-old dam.

For more information, contact John Tippett, Executive Director, Friends of the Rappahannock, P.O. Box 7254 Fredericksburg, VA 22404. Phone: (540) 373-3448; e-mail: cleanriver@pobox.com

Dow Chemical Company

The Dow Chemical Company's Saginaw Bay Watershed Initiative Network (WIN), funded by 12 private and community foundations, initiates and implements projects to improve the quality of life in the Saginaw Bay watershed using sustainable development concepts. The Saginaw Bay watershed in Michigan contains the largest contiguous freshwater coastal wetland system in the United States. WIN has assigned Task Groups to develop projects that address several major watershed issues, including land use, agriculture/pollution prevention, water resources, communication, youth, wildlife stewardship, and marketing. Each Task Group sets measurable goals and identifies projects to meet those goals. WIN Task Groups have launched projects to protect habitat, improve access to the bay, foster nature-based tourism, inform people about NPS pollution, and support sustainable agriculture. The WIN program empowers the watershed residents to help themselves and supply funding for innovative programs. The program is a natural extension of Dow's philosophy of investing in its communities — and encouraging the communities to invest in themselves.

For more information, contact Cindy Newman, Public Affairs, The Dow Chemical Company, 47 Building, Midland, MI 48687. Phone: (517) 836-5783; e-mail: cnewman@dow.com. Or visit the WIN web site at www.saginawbaywin.org.

[For more information on the National Watershed Awards, contact CF Industries, Inc., 1401 Eye Street, NW, Suite 340, Washington, DC 20005. Phone: (202) 371-9279; fax: (202) 371-9169; web site: www.cfindustries.com/commrelations/watershed/watershed.htm.]

Watershed Protection Training

Every day local municipal officials, planning boards, city and county councils, and city managers around the country are confronted with complex issues relating to urban runoff, best management practices, and the protection of streams, lakes, and wetlands. To help provide objective and practical information on better site design and watershed planning programs to urbanizing communities, the Center for Watershed Protection conducts interactive workshops around the country teaching planners, developers, local officials, regulators, and other stakeholders about the benefits of watershed planning and innovative site design techniques. One workshop in Lancaster, Pennsylvania, in December 1999 attracted more than 50 registrants from watershed associations, conservation offices, the Pennsylvania Department of Environmental Protection, universities, and



planning and engineering firms around the state. The participants' positive comments typified those of other workshop attendees nationwide. One participant commented, "It really opened my eyes to some of the new techniques out there."

The first day of the Center's interactive workshop is geared toward practical and quick strategies for preparing local watershed plans to protect urban water resources. Special focus is given to the value of using the amount of impervious cover in a watershed as an indicator of water quality and as a watershed management tool. A range of common watershed management issues are addressed in depth, including specific techniques for protecting urban streams, lakes, estuaries, and aquifers. During the rapid watershed planning session of one workshop, a government official commented, "This is a very good program. We need to get the word out to the municipal governments to learn the condition of our watersheds, as many (including myself) are not informed enough."

The workshop's second day emphasizes innovative site planning techniques designed to strike a balance between a community's need for growth and watershed protection issues by helping planners and developers find ways to reduce impervious cover, better manage storm water runoff, and conserve a site's natural areas.

Both days of the Center's workshop include hands-on exercises that allow participants to immediately apply workshop strategies and techniques to real-world watershed and site development plans.

Often, participants say that they can't wait to get back to work to share what they've learned. Stressed one workshop attendee, it's "very good information that needs to be presented to developers, regulators, environmentalists, and others."

And certainly these types of workshops are essential in fostering a better understanding of the importance of watershed protection and jump-starting a move toward smarter, better, more ecologically sound development. Because the Center is able to conduct only a limited number of workshops each year, it has begun developing resources designed to provide planners, developers, and watershed managers nationwide with the tools to craft their own better site design and watershed planning workshops. A critical part of this effort includes a new "Train the Trainers" workshop. Scheduled to take place in the spring and summer of 2000 in the Chesapeake Bay watershed in Maryland, this new workshop will provide stakeholders with the skills, information, and resources they need to begin educating others about the specifics of watershed protection and to start the process of changing their own local development rules.

The Center's web site (www.cwp.org), also plays an essential role in helping others disseminate the watershed protection message by providing a wide array of tools — from technical articles to handbooks to sample model ordinances — at little or no cost. Articles from past issues of the Center's journal, *Watershed Protection Techniques*, are available for downloading, as are more than 30 model ordinances from around the country designed to help local planners employ the most effective language possible in their own ordinances. The site also lists the Center's full catalog of available technical publications, including the *Rapid Watershed Planning Handbook* and *Better Site Design*.

In addition, the Center has packaged its workshop presentations into a Watershed Leadership Kit, available on CD-ROM. The Watershed Leadership Kit consists of three animated training presentations that provide an excellent introduction to Impacts of Urbanization, Eight Tools of Watershed Protection, and Better Site Design. Each CD can be used as a complete stand-alone presentation for planners, engineers, activists, or community leaders interested in crafting watershed protection seminars, or users can use the kit as a resource for facts, photos, illustrations, charts, and diagrams to support their own presentations (each CD is \$25, or the set can be purchased for \$60). Even if the Center staff were able to conduct workshops each day of the year, they would still not reach every critical or threatened watershed in the country. Therefore, these types of resources are essential to ensure that others can continue to carry the torch of watershed protection.

[For more information on the dates and locations of Center workshops or on its training resources, contact the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043. Phone: (410) 461-8323; fax: (410) 461-8324; web site: www.cwp.org.]

Agricultural Notes

California Farmers Adopt Tradable Loads Program to Reduce Selenium in Agriculture Irrigation Runoff



Traditionally, water pollution trading policies have been designed for trades among point sources (such as factories) or between point and nonpoint sources. However, farmers in California have recently adopted a system of tradable loads to reduce the amount of selenium in runoff from irrigated fields as one part of an effort to deliver high-quality water to wetland habitats. This is possibly the first time a tradable loads program has been established among nonpoint sources.

The Grassland Drainage Area, located on the western side of the San Joaquin Valley, is agricultural land that is farmed for cotton, cantaloupe, alfalfa, tomatoes, sugar beets, garlic, onions, asparagus, wheat, barley, and rice. Because much of the land in the Grasslands Drainage Area has a shallow layer of clay, it must be tiled to avoid raising the water level and damaging the crops. In other words, the land has been plumbed so that agricultural drainage water is collected in tiles under the fields and then pumped out through sumps. Unfortunately, the soil contains a high level of selenium, a naturally occurring toxic trace element. This selenium is carried out through the sumps by the agricultural drainage, threatening the health of birds and other wildlife that depend on the San Joaquin River.

The San Louis Drain

The San Louis Drain was constructed in the 1970s to carry the drainage water from several drainage areas, including the Grassland Drainage Area. It was originally intended to span all the way to the Sacramento-San Joaquin River Delta and serve several hundred thousand acres in the west side of the San Joaquin Valley. However, it was completed only part way and terminated at Kesterson Reservoir. In the early 1980s, selenium was detected in the water coming into the Kesterson Reservoir from another drainage area, and so the San Louis drain was closed and never used again — that is, until the farmers themselves got involved.

Use Agreement with the Bureau of Reclamation

Several irrigation and drainage districts (including all of the areas within the Grasslands Drainage Area), which are local government bodies, joined forces in March 1996 to exercise common powers for the purpose of managing agricultural drainage. The group is called the Grassland Area Farmers. One of the initial goals of the Grassland Area Farmers was to use the San Luis Drain for its original intent — as an outlet for agricultural drainage. To that end, they entered into a five-year use agreement on November 3, 1995, with the Bureau of Reclamation, the drain's owner. The agreement did not formally begin, however, until discharges commenced on October 1, 1996. The five-year term ends on September 30, 2001. As part of the use agreement, the Bureau set a cap on the total amount of selenium that the Grassland Area Farmers could discharge. The cap was set to decrease for each of the last three years of the project, meaning less and less selenium discharge would be allowed over the life of the agreement. Plans are under way to complete another use agreement that would extend use of the drain for another five years.

Tradable Loads Program

The Grassland Basin Drainage Steering Committee (GBDSC), the governing body of the Grassland Area Farmers, first adopted a rule establishing a tradable loads program on June 26, 1998. Under the program, the total allowable regional selenium load is allocated among the member irrigation and drainage districts. The districts can either meet their load allocation or buy selenium load allocation from other districts. The theory is that the region as a whole will meet its regional load target at a lower cost than the cost without the trading. This is because selenium reduction measures will be taken where they are cheapest to implement. In addition, the program should spur innovation by bringing decision-making regarding selenium reduction measures to a more local level. Finally, the tradable loads program aims to distribute equitably among the districts the costs of selenium discharge reduction.

The Grassland Basin Drainage Steering Committee

For several reasons, the rule did not have a significant impact during water year 1998 (October 1, 1997–September 31, 1998). To begin with, water year 1998 was nearly over by the time the rule was adopted. More importantly, however, water year 1998 was an El Niño year that yielded the heaviest rainfall in the Grassland Drainage Area during the 50-year period of record. Because increasing irrigation efficiency plays a major part in lowering selenium discharge, the heavy rains caused the Grassland Area Farmers to exceed their regional selenium load targets even when they were not irrigating. The GBDSC's oversight committee, charged with ensuring that the cap is met each year, determined that "uncontrollable and unforeseeable events" caused the exceedances during those months in water year 1998, resulting in only one trade.

The second year of the program was much more successful. The GBDSC adopted a rule establishing a tradable loads program for water year 1999 on January 18, 1999. The 1999 rule differs slightly from the 1998 rule. In 1998, the fee for any exceedance over the regional selenium load target was divided among the districts that exceeded their selenium load allocation (SLA). In the 1999 water year, the rule also included a fee and rebate system that imposed fees on districts that exceeded their SLA (regardless of whether the region exceeded its target) and awarded rebates to districts whose discharge was lower than their SLA. In 1999 there were eight trades. The rule for water year 2000 remains the same except that the SLAs are set even lower and the fee for not meeting them is even higher. Two trades have taken place already, and a third is nearing completion; several more are under consideration.

Progress in the Grassland Drainage Area

The tradable loads program works together with other district-specific policies to reduce selenium influx. Because increasing irrigation efficiency reduces selenium discharge, many of the programs designed to encourage water conservation through irrigation efficiency also decrease selenium discharge. For example, Broadview Water District, one of the member districts of the Grassland Area Farmers, pioneered a tiered water pricing policy in which increasing block-rate pricing motivates the use of water conservation practices. Other districts in the Grassland Drainage Area have followed suit by implementing their own tiered water pricing policies. Additional incentive-based water conservation programs in the Grassland Drainage Area include low-interest state revolving fund loans and land management incentives. This work is supported by Clean Water Act section 319 funding from EPA for controlling nonpoint sources.

Irrigation system improvements in the Grassland Drainage Area include quarter-mile furrows (in place of half-mile furrows, which cause excess percolation at the top of the furrow), gated pipe (allowing more accurate control of irrigation water), sprinklers, and drip irrigation systems. Districts also pursue methods aimed directly at selenium reduction, including recirculation of drainage water, displacement of selenium by using selenium-laden water to wet roads for dust control, and even some selenium removal projects. Currently, the districts are still in the experimental phases of such selenium removal projects. The most promising treatment will likely be a combination of reducing the volume of drainage through irrigation on salt-tolerant crops and membrane treatment such as low-pressure reverse osmosis followed by a solidification process and disposal of solids.

With the exception of the very wet water year 1998, selenium discharge data show continual reduction in selenium discharge since water year 1995. In fact, in 1999 selenium load targets were met every month and the loads are predicted to be the lowest since 1986. Project Director Susan A. Austin believes that the tradable loads program will soon catch on in other areas. "It is a working demonstration of how market forces can be used to create the right incentives for meeting environmental goals in a fair and efficient manner," she said. "It is one important policy tool among the many that the Grassland Area Farmers use to control subsurface drainage."

[For more information, contact Joe McGahan, Drainage Coordinator for the Grassland Area Farmers, Summers Engineering, Inc., P.O. Box 1122, Hanford, CA 93232. Phone: (559) 582-9237; e-mail: jmcgahan@summerseng.com; or Susan A. Austin, Project Director, P.O. Box 31934, San Francisco, CA 94131-0934. Phone: (415) 584-8921; e-mail: susanaustin@msn.com.]

Georgia's WATER/FAIR Project Features Farmers in Field Sampling

"Seeing is believing." That bit of common sense was all that was needed to create a unique approach to assessing the impact of management practices on agricultural nutrient runoff in Georgia. This new approach features water quality and runoff monitoring by producers on their own lands since the data they collect has been found to be of the same quality as that collected by professional water quality technicians.

Dory Franklin, a geographer and doctoral student who works for the USDA Agricultural Research Service (ARS) in Watkinsville, Georgia, helped develop the project, which is funded by the Sustainable Agriculture Research and Education (SARE) program. The official name for the Georgia initiative is WATER/FAIR, Watershed Assessment Through Ecological Research/Farmers Active in Research. The project was developed by Franklin and a team of agricultural producers, educators, researchers, and students to determine sustainable management practices that protect water quality and to identify incentives needed for producers to adopt such practices. Sustainable farming includes keeping soil—and its nutrients—on the land and out of surface and ground waters. The team has carried out four objectives under the initiative.

First, they assessed the spatial and temporal nitrogen and phosphorus inputs into the Rose Creek and Greenbrier Creek watersheds, and examined linkages to land management practices. The team collected base flow water quality data for nitrate, ammonium, orthophosphate, total nitrate, total phosphorus, pH, and temperature on first through fourth order stream segments beginning in December 1998 for 14 agricultural management systems in five categories (grazing land, cropland, forests, poultry, and dairy). Samples were taken from streams by using rising flow samplers and conventional methods and from fields by using small in-field "dustpan" runoff collectors. Stream networks and watershed boundaries were digitized from digital graphics. Digital elevation models with 30-meter resolution were imported, rectified, and joined. In addition, a global positioning system was used to gather positional data on some of the research plots with known contributing areas (2-meter resolution). A comparative analysis of several computer techniques for identifying contributing areas showed that some techniques could identify contributing areas within less than 1.0 percent of the known contributing areas.

Second, the team compared volunteer-assessed nitrogen and phosphorus water quality data to technician-collected data using field test (Hach) kits and laboratory analysis of the same samples. Test kits were collected and recalibrated in the laboratory for the second set of reagents for quality assurance. Franklin developed a unique method for standardizing the shaking tempo and time for nitrate analyses. "We needed a way to get everyone on the same page [on the nitrate tests]," Franklin said, "and found that 'Heartland,' a popular country song by Darren Coggan, was exactly the right tempo. We spliced in a segment so it ran exactly 3 minutes and made tapes for everybody to calibrate the tests. It works great!" The group also conducts comparative analyses of turbidity, both nephelometric (a measure of the density of suspended particles) and colorimetric, as well as total suspended sediments for both base flow and event flows. All farmers in the program have water quality test kits.

Next, the team evaluated the incentives needed to encourage producer adoption of sustainable management practices. They developed and administered a survey on land use/land management impacts on water quality to project participants (farmers, researchers, educators, students) before they started the project. In addition, Dr. Mark Risse and Henry Hibbs of ARS are comparing the results from Farm*A*Syst, a series of environmental self-assessments addressing specific areas of concern, with water quality impacts (nutrient concentrations coming in the farm minus nutrient concentrations leaving the farm).

And finally, the project educates agricultural producers, youth, and the community on nutrient movement and its potential impacts on water quality. Scientists and educators from the project have participated in the University of Georgia Cooperative Extension Service's statewide training program for extension agents to share information and explore how the project involves farmers in monitoring their management practices to determine which methods are working and which may

need some modification. Visitors from Ethiopia and Senegal visited recently to see how the Rose Creek and Greenbrier Creek projects could be adapted for participatory projects they are trying to develop. Farmers helped in the demonstrations and were able to find commonalities in each other's work.

Assisted by a student volunteer who is a member of Future Farmers of America, WATER/FAIR is starting to hit full stride now, though dry conditions have slowed progress somewhat. The project was featured in the Southeast Watershed Forum newsletter and is supported by the Conservation Technology Information Center at Purdue University. WATER/FAIR also incorporates research from the workbook *Nutrient Cycles in the Southern Piedmont*, from the University of Georgia.

Franklin said farmer response to the program has been "very good" and noted that taking time to conduct training was essential since "some people are more comfortable than others" in learning and applying the monitoring methods. "The producers we work with are very interested in finding out exactly what works, how well it works, and why," Franklin added. "They want healthy streams like everyone else."

[For more information, contact Dory Franklin at (706) 769-5631, ext. 215, or e-mail dfrankln@arches.uga.edu. Other information on USDA Agricultural Research Service projects at the J. Phil Campbell, Sr. Natural Resource Conservation Center in Watkinsville, GA can be found at www.spcru.ars.usda.gov.]

Core 4 Conservation: A New Strategy Using Old Tricks to Protect Water Quality



Core 4 Conservation offers a new way for farmers around the country to reduce NPS pollution from agricultural lands while improving farm profitability. An integrated farm management system, Core 4 Conservation provides a new approach to using existing agriculture conservation practices to achieve the goals of better soil, cleaner water, greater profits, and a brighter future for the nation's agricultural sector.

Following the principles of Core 4 Conservation, producers implement a system of basic land treatment practices to better manage inputs, filter NPS runoff, improve soil quality, and protect water quality. The practices, which include conservation tillage, crop nutrient management, integrated weed and pest management (IPM), and conservation buffers, are not new or revolutionary. What is new, however, is that under the Core 4 Conservation approach appropriate practices are integrated into a management plan that considers local conditions, individual farm size, management capabilities, and the financial conditions of the producer. Other practices may be needed to meet site-specific conditions. In this way, producers voluntarily use conservation practices tailored to their situation to do their job — produce food, fiber, and energy — while protecting the environment.

Benefits of Core 4 Conservation

■ **Better soil.** Sustainable soils (i.e., those that meet production and environmental quality needs) are critical to long-term productivity. When properly planned and applied, Core 4 Conservation can improve long-term soil productivity. Benefits of this integrated approach include increased organic matter, improved moisture retention, enhanced water infiltration, reduced soil compaction, and reduced erosion.

■ **Cleaner water.** Healthy soil, conservation buffers, and properly managed inputs can reduce runoff, filter pollutants, and help to protect lakes, rivers, and streams. Along with food, fiber, energy, and other renewable resources, agriculture also works to protect and improve water.

■ **Greater profits.** By using the latest technologies and sharpening management skills, growers achieve higher levels of economic efficiency and cropland productivity with Core 4 Conservation.

■ **Brighter future.** Consumer expectations of agriculture are growing. In addition to safe, economical, and abundant agricultural products, consumers expect agriculture to protect air, soil, water, wildlife, and other natural resources. Although growers have always respected and clearly understood the importance of protecting natural resources, now is the time to take action, build on past successes, and inform consumers about this unprecedented agriculture-wide effort.

“Core 4 is common sense conservation,” said John A. Hassell, Executive Director of Conservation Technology Information Center (CTIC), a unique public-private, agriculture-based partnership leading the national campaign to promote this integrated approach to farm management. “Core 4 Conservation is adaptable to virtually any farming situation. When it is fine-tuned to meet an individual farmer’s specific needs, it will protect the environment, save money, and increase profits,” he said. Core 4 Conservation also advocates annual evaluation of a farm’s integrated management system to ensure the practices fit the farmer’s needs and specific farm characteristics.

Scientists and other experts estimate that the use of this approach can reduce NPS pollution from cropland by as much as 80 percent. For example, no-till reduces soil erosion by 90 percent when compared to an intensive tillage system, and conservation buffers remove 50 percent or more of nutrients and pesticides and 75 percent or more of soil in runoff.

“Improved environmental quality is achievable with today’s high-production systems if they are managed properly,” said Jerry Hatfield, laboratory director of the USDA-ARS National Soil Tilth Laboratory in Ames, Iowa. “We can make environmental quality and profit a winning combination if we break away from traditional farming methods.” Hatfield said research in Iowa watersheds has shown a significant decrease in pollutant loadings with implementation of efficient management systems. “Core 4 common sense conservation is a way producers can design the most economical management plan for their land that will, in addition, provide environmental benefits,” he said.

The key to implementing Core 4 Conservation across the country is on-farm assistance, stresses Hassell. District conservationists, county extension agents, soil and water conservation district staff, agricultural retailers, and independent crop consultants will be the primary source for local information to help develop Core 4 Conservation management plans.

Five full-color brochures describing the Core 4 approach and practices are available from CTIC and local NRCS and extension offices. In addition, CTIC is developing Core 4 Conservation kits, fact sheets, and other informational material to promote the integrated management approach.

[For more information contact the Conservation Technology Information Center at (765) 494-9555 or visit the CTIC web site at www.ctic.purdue.edu.]

Notes on Education

Our Environment, Coast-to-Coast

A month-long trek across the country sounds like nonstop fun. This summer, five teachers are leading a group of 20 high school students from Harrisonburg, Virginia, on a 34-day, 10,000-mile field trip around the country that will likely prove to be the greatest learning experience these students have ever had. This endeavor, known as “Coast-to-Coast 2000,” will allow students to explore how environmental issues combine with social, economic, and political realities to create natural resource management challenges. Ecology/earth science teacher Ryan Sensenig explained the Coast-to-Coast philosophy: “We need to equip our youth with the skills needed to live in an increasingly complex world. It is essential that education be inextricably linked to the issues and realities of the surrounding communities. Connecting the educational process to the pulse of the local environment makes education relevant.”

The objectives of Coast-to-Coast 2000 are ambitious but attainable. The trip will (1) allow students to be scientists by working with professionals in a variety of field investigations; (2) foster a dialogue among educators, students, and resource professionals regarding how to meet our nation’s growing challenges in natural resource management; (3) bring the world into our schools by providing case studies, interviews, data, and student responses on the Coast-to-Coast web site; (4) give students an opportunity to critique, analyze, and debate the diverse philosophies of natural resource management by meeting the people immersed in the issues; and (5) give voice to students’ proposals on how to develop a sustainable land ethic.

The teachers led a similar Coast-to-Coast trip in the summer of 1998. On that trip, 22 students traveled around the country studying water resources issues. Teachers noted that the most successful portions of the trip involved the case study discussions with resource professionals, during which students learned not only about water resource problems, but also how the many players and factors caused and have continued to fuel the problems. "Students were greatly affected by how natural resource issues impacted people — we could see their passion grow for each issue as they learned about it," explained Sensenig. "Consequently, this year's trip will have a different focus. Our theme is 'Finding a Land Ethic' and we'll be researching case studies in resource management at each stop."

Coast-to-Coast 2000 Itinerary

During their visits to diverse locations around the country, students will learn about a pressing local environmental issue by talking to many individuals, including natural resource professionals and local stakeholders, educators, and politicians. For more information about each of the following stops, visit the web site at <http://harrisonburg.k12.va.us/c2c2k/>

Agriculture: Finding a sustainable agriculture – Salina, KS

Chicken houses, urban lawns, and blue crabs – Port Isobel, VA

Dams: Hydroelectricity (benefits and tradeoffs) – Glen Canyon Dam, Grand Canyon National Park, AZ

Energy: Nuclear, solar, wind, or hydroelectric? Martinez, CA

Energy and consumption: Costs of our lifestyle – Las Vegas, NV

Fire: The burning debate — challenges of wildfire – Grand Tetons National Park, WY

Fisheries: To dam or not to dam – White Salmon River, WA

Forests: Forest ecology of old growth – Redwood National Park, CA. Forestry and timber management – Oregon National Forests

Human population: Humans, wildlands, and John Muir – Yosemite National Park, CA

Human resources: Human creativity and solutions – Vernier Software Company, OR

Management philosophies: Edward Abbey's insights – Arches National Park, UT. Navajo insights – Monument Valley, UT

Marine fisheries: Managing the ocean ecosystem – Monterey Bay, CA

Rivers: Riparian ecology and human dimensions – Colorado River, CO

Water use: Desalination, pipelines, and aqueducts – Morro Bay, CA

Watersheds: Protecting our water sources – Rocky Mountain National Park, CO, and Shenandoah National Park, VA

Wildlife: Bison brucellosis (bison and cattle) – Yellowstone National Park, WY. Black-footed ferret and endangered species – Badlands National Park, SD.

Case Studies Across the Country

The first opportunity to explore a case study will take place in April before the official 2000 trip begins. The group will travel to Port Isobel, Virginia, in the Chesapeake Bay to explore how nutrient runoff affects the bay. There they will learn how the lifestyles of people living on the bay and in its watershed can affect a larger environmental resource and the people who depend on it. Students will talk to diverse stakeholders, including watermen, Chesapeake Bay educators, and legislators to try to gain an understanding of the complex challenges faced in managing the health of the bay. The students will be challenged to be creative in solving problems and will be asked to answer the question "What should be done to protect these ecosystems?"

Later in the summer, on the other side of the country, the students will study riparian issues in an arid climate. While rafting down the Colorado River, the students will learn about the mechanics and general health of our nation's rivers. The students will then explore riparian management issues along the Colorado River, addressing the views of diverse stakeholders involved in local river use and protection. They'll discuss how and why human use has affected the riparian areas along the Colorado River. After considering the multifaceted problem, students will be asked to suggest how the river should be managed.

"This is an applied, rather than theoretical approach," noted Sensenig. "Students will be asked to consider how what they learned can be applied to similar problems across the country. In fact, after the trip we hope to continue to engage students in direct dialogue with researchers across the country who are dealing with these issues."

Twenty-one additional stops are currently scheduled (see box). Each will allow the students to delve deeply into a local resource issue, gaining a thorough understanding of why a problem exists. When appropriate, students will gather environmental data to help them further understand the issues. Students will be required to keep a log of each day's events and learning experiences.

Today's web-based technology will allow students to share their thoughts and questions with the world during and after the trip. Students will maintain the "Coast-to-Coast 2000" web site daily, including updates about the current case study and posting of

student log entries. An active e-mail link will be available on the web site to allow people to ask questions and discuss the issues with the students.

For those who stick to conventional forms of communication, the group plans to call in a daily progress report to the local public radio station and newspaper in Harrisonburg. The group also hopes to work with the local ABC station and other ABC affiliates around the country to air some video of the trip to those back home.

Costs Versus Benefits

The month-long, high-mileage trip will cost an estimated \$69,000, which includes food, lodging, camping fees, bus transportation, technology costs, rafting fees, entrance fees, staff stipends, and educational fees. Because Coast-to-Coast is considered a field trip, students are covered under school insurance, and no additional insurance is required. Students are asked to pay a little over \$1,000 each, much of which will be raised through fundraisers conducted this spring. Trip organizers have already begun soliciting local donations and writing grant applications to offset the remaining \$45,000 in expenses.

Myron Blosser, Biology/Molecular Genetics teacher, is leading the fundraising efforts. "The support we received from our community in 1998 was tremendous," she said. "We raised \$35,000, with donations ranging from \$25 to \$4,000. Although it was a lot of work going to the community, the benefits were tremendous. It made our trip more special knowing that our community was behind us."

Jessica Yoder, a 1998 Coast-to-Coast participant, described the trip from a student's perspective.
"We've seen nature's miracles — primordial redwood forests, snow-peaked mountains in the desert, towering canyons, and tumbling rivers. We have felt small and big, fatigued and inspired, peaceful and awed. We will never be the same."

The upcoming trip has a higher price tag than the 1998 trip because it includes additional recreational and research opportunities for the students. Therefore, trip leaders are seeking grant money to supplement local donations. Nevertheless, the cost of the trip is easily outweighed by the educational benefits realized by the students. "Students will rub shoulders with the scientists who are collecting the data and tackling the problems. They'll gain a new perspective and focus. In fact, the hands-on experiences provided by Coast-to-Coast might affect the way some students view the remainder of their schooling. A few students from the 1998 trip have transferred from one college to another because they were unhappy with the lack of hands-on learning experiences that were available," noted Sensenig.

Although he knows it might sound difficult, Sensenig emphasized that "many schools are beginning to experiment more with making learning more real-world. Other educators can easily incorporate this approach into their teaching — this is not radical by nature. You don't have to travel across the country. If you can make the issue relevant, the students will teach themselves."

[For more information, contact either Ryan Sensenig (itinerary and curriculum) or Myron Blosser (fundraising) at Harrisonburg High School, 395 South High Street, Harrisonburg, VA 22801. Phone: (540) 434-4923; e-mail: cst2cst@shentel.net; web site: <http://harrisonburg.k12.va.us/c2c2k>.]

Living' La Agua Pura — Educating the Latino Community About Clean Water



Ricky Martin isn't the only Latino trend that's revving up teenagers lately. In Santa Barbara, California, a new effort to educate the Latino community on water quality issues has Latino youth leaders learning ways to get their friends and families involved in watershed protection.

The University of Wisconsin's Cooperative Extension Environmental Resources Center (ERC), in Madison, Wisconsin, works to educate young people about water issues nationwide. The ERC recently conducted a workshop targeted at addressing the watershed education needs of the underserved Latino youth community in Santa Barbara.

"Underserved members of our communities are often most affected by water-related health risks," explained Molly Thompson, coordinator for the ERC's Give Water a Hand program.

“Additionally, quality of life issues and personal or community barriers may limit their involvement in local water quality protection activities.” This segment of the population is generally ignored when it comes to getting communities involved in watershed protection because of the language barrier.

In Santa Barbara, the area of the highest Latino population density is also where the creeks are the dirtiest from upstream sources. These polluted creeks drain into the Pacific Ocean off Santa Barbara, forcing beach closures that affect everyone. ERC is working in a variety of watersheds, including Mission Creek, Arroyo Burro, San Antonio Creek, and the Santa Maria River. “Like everyone else, many members of the Latino community go to the beach. Kids play in the creek. Latinos are definitely interested in the problem. However, because of language and cultural issues, community members are often not engaged in water protection activities,” explained Mike Marzolla, 4-H Youth Development Advisor for the University of California Cooperative Extension in Santa Barbara County. “Usually, people in charge of outreach are not Latino and do not speak the language. Therefore, they do not know how to reach the Latino community.”

The ERC's Agua Pura workshop, officially known as the Watershed Education Leadership Institute, was a partnership effort involving the ERC, the California Aquatic Science Education Consortium, the University of California Cooperative Extension 4-H Youth Development Program, the Global Rivers Environmental Education Network, and the Adopt-A-Watershed Program. The institute was funded by a USDA Cooperative State Research Education and Extension Service (CSREES) grant, and its purpose was to improve understanding of how community educators and youth leaders can involve Latino youth in watershed protection and to begin to understand how resources need to be adapted to their needs and interests.

Watershed Education Leadership Institute

The June 1999 leadership institute focused on gathering the people who work with Latino youth on a regular basis, including teachers, scout leaders, park rangers, museum employees, and other youth leaders. Some participants, including those from the Urban Creek Foundation and the local Water District, attended because they recognized an opportunity to expand their outreach programs. The first day of the three-day institute was spent familiarizing youth leaders with local watershed issues, including water quality problems, ongoing water quality studies, and water quality monitoring efforts. Youth leaders then participated in hands-on activities, including mapping a watershed, assessing erosion and other impacts along a creek bed, and sampling for water quality and macroinvertebrate populations in a local stream.

The second day of the institute focused on teaching the youth leaders how to better understand the young people they work with and how to be more effective leaders. Discussions included the factors that affect adolescent behavior, the use of poetry and art to educate youth, and identification of outreach methods available to involve the Latino community in water education programs.

The third day of the institute focused on linking youth with education opportunities. Topics addressed included the availability of watershed education resources and ways for youth leaders to conduct a community education planning activity. A series of discussions followed, which included characterizing the Latino community and assessing how curricula and activities could be modified to suit the needs of Latino youth. Through this idea exchange, the youth leaders determined that the following actions are needed to better reach out and involve Latino youth in water programs.

Reaching the Community

First, the leaders noted from experience that the Latino community is very centered around the family. Latino youth do not tend to participate in many activities without other family members. Therefore, watershed activities must be family-oriented and designed so that parents and other family members can also participate. Moreover, youth leaders must communicate with parents about the activities. “It helps to have individuals, preferably Latino, go door to door and talk with the parents, explaining the after school activity and welcoming them to participate,” noted Thompson.

Second, curricula must be appropriate for the Latino youth audience. The experiences of youth leaders and educators have shown that “a number of educational resources written in Spanish are poorly translated, leading to a communication breakdown,” explained Thompson. “We must remember to account for the many types of Latino backgrounds — Mexican, South American, and Central American. Sometimes their languages differ slightly.” Institute participants also noted that Latino youth seem to enjoy the inclusion of Latino history and graphics relevant to their culture in their curricula.

The workshop was a success. The participants gave high ratings to all workshop topics on the evaluation forms, but most noted that the Latino outreach discussion and the artistic connection topics on the second day were the most useful. Many participants also commented that the workshop gave them great insight into working with Latino youth and their families. The ERC will use the information gathered from this workshop to develop a guide to help other youth leaders provide watershed education to people in underserved Latino communities. ERC expects the guide to be available in April 2000.

Building on the success of the Agua Pura workshop, the University of California Cooperative Extension has held a series of additional workshops in the Santa Barbara area, targeted to people who work with the Latino community as well as Latino adults and children. Student interns have been conducting streamwalks for Latino children and other community members. “People generally don’t pay much attention to their nearby creek. However, once you investigate it, you become more interested,” noted Marzolla. He sees the need for additional outreach and education in the future for both the Latino community and those who teach them. “This really is a long-term issue. Education doesn’t happen overnight.”

[For more information about the workshop, contact Molly Thompson, Give Water a Hand Program Coordinator, University of Wisconsin Environmental Resources Center, 1450 Linden Drive, Room 216, Madison, WI 53706. Phone: (800) WATER20; e-mail: erc@uwex.edu. For information about the Latino outreach efforts in Santa Barbara, contact Michael Marzolla, 4-H Youth Development Advisor, University of California Cooperative Extension Service Santa Barbara County, 105 East Anapamu, Suite 5, Santa Barbara, CA 93101. Phone: (805) 568-3330; e-mail: ammarzolla@ucdavis.edu]

Watershed Stewardship Training Leads to Community Commitment



Most people spend their Fridays at work waiting for five o’clock to roll around so their weekend fun can begin, but for 10 weeks last fall several residents of Clark, Cowlitz, and Skamania counties in Southwest Washington started their weekend fun a little early. Each Friday from September 17 through November 19, citizen volunteers attended a new watershed stewardship course to learn ways to reduce the impact of storm water runoff from homes, roads, shops, and offices.

The course, offered by Washington State University Clark County Extension, emphasized voluntary measures people can take to reduce the impact that surfaces such as roofs, roads, sidewalks, and parking lots have on flooding and storm water pollution. The Watershed Stewards of Southwest Washington, as they’ve come to be known, also learned ways to improve habitat for fish, including the four endangered species of salmon that live in Clark County waters. In addition, various presentations on how to incorporate watershed education into children’s programs were also given. Students learned about storm drain stenciling, 4-H, and other children’s programs that incorporate environmental education.

Kali Robison, the program’s coordinator at Clark County Extension, stressed “there is a gap in adult education when it comes to watershed protection. There are many programs targeted at children, but we’ve found that adults tend to understand water quality problems more fully when other adults are doing the teaching.”

In exchange for the Friday training sessions, the participants commit to participating in several watershed protection activities, including working with kids or other adults and helping to organize watershed training events, wetland restorations, tree plantings, and more. At the beginning of the course, Robison states, “We’ll give you 60 hours of training if you give us 60 hours of your time and effort toward watershed stewardship.” In September, 18 volunteers

signed up to meet the challenge, including a county planner, a chemical contractor for the local government, and a builder. In addition to protecting their local water resources, many of the participants hoped to use the opportunity to network, gain access to more watershed-related information, or just to meet people in other fields.

Course presenters are drawn from a variety of sources, both public and private. With few exceptions, presenters are expected to have at least a master's degree in an appropriate field of study, as well as related experience. Many of them are from Washington State University, the Environmental Information Cooperative, private businesses, and government agencies.

The program has been such a success that the Watershed Stewards have decided to form their own nonprofit watershed protection organization and apply for an Environmental Education Grant from EPA to help continue their work. If a grant is received, they plan to develop two Citizens Outreach Water Quality Education Workshops — one in the fall of 2000 and another in the spring of 2001. In addition, the Watershed Stewards hope to soon offer training and certification classes for professionals. Participants would attend Saturday classes for a set fee, which would cover the cost of presenting the class. Potential training and certification classes might cover "salmon-friendly landscaping" for maintenance and landscape contractors, habitat restoration and stream monitoring for teachers, and erosion control.

The Watershed Stewards have partnered with the Washington State University Vancouver Multimedia Applications Research Studio (MARS lab) to launch a web site that will organize and present training and education materials to the public at large. The site will also provide links to Washington State University, local governments, state and federal agencies, and a variety of conservation-oriented organizations such as Target Earth and AmeriCorps.

A second Watershed Stewardship course runs every Friday from 9 a.m. to 4 p.m., March 17 through May 19. A third course is scheduled to run from September 15 through November 17.

[For more information or to sign up for the next workshop, contact Kali Robison, Clark County Extension Service, 11104 Northeast 149th Street, Building C-100, Brush Prairie, WA 98606. Phone: (360) 254-8436; fax: (360) 260-6161.]

Reviews and Announcements

Get to Know Your Swamp!



How does a playa differ from a marsh? Find the answer — and much more — in *Unlocking the Secrets of America's Wetlands*, a beginner's guide to wetlands. Teachers and their students, parents, citizens of all ages — everybody who wants to understand wetlands — will find in this 42-page primer:

- A detailed overview of what wetlands are
- How we use — and enjoy — them
- Why they're valuable
- How to recognize the different types
- How we can protect them
- A description of Ramsar and U.S. wetlands of international importance
- A glossary
- Photos by people all over the country
- Lists of programs and resources
- A coloring poster that shows how we treat wetlands (with either good or bad results)

[Produced by the Terrene Institute in cooperation with U.S. EPA Region 5 and Headquarters, the book can be purchased from Terrene for \$12.95 plus \$3.50 shipping and handling by calling (800) 726-5253 or sending a check to 4 Herbert St., Chantilly, VA 22305.]

Planning for Clean Water: The Municipal Guide



When asked what tools they need to reduce NPS pollution, municipal and county planners in New Jersey agreed that what they needed was a guide to show local planning board members how to incorporate NPS concerns into the local planning process. Consequently, the New Jersey Division of Watershed Management developed a guide for planning board and environmental commission members showing how water quality concerns can be voluntarily incorporated into master planning, zoning ordinances, and the site plan review process. Instead of providing BMPs for every situation, the guide provides concepts and examples of tools, along with directions on where to get more information. It explains the effects of development on water quality, how to identify problems and opportunities, how to evaluate various strategies for water quality protection, and more.

To order the guide, contact the New Jersey Department of Environmental Protection's Division of Watershed Management at (609) 292-2113.

National Watershed Outreach Conference



Are you fresh out of new and innovative ways to get citizens in your community involved in watershed protection activities? Look no further. Register to attend the National Watershed Outreach Conference in San Diego, April 17-19, 2000, and learn how other groups are getting their word out. EPA, the Aquatic Outreach Institute, The University of California Cooperative Extension, the UC Sea Grant Extension Program, and the County of San Diego Watershed Working Group are sponsoring the conference. It will include a combination of preconference workshops, concurrent session presentations, informal discussion sessions, and field trips.

The following topics will be covered at the conference:

- Creative Curricula
- Using Outreach to Meet Regulatory Goals
- Funding Your Outreach Efforts
- Targeting a Specific Audience
- Making the Most of Your Outreach
- Beyond the Fact Sheet: Creative Outreach Products
- Evaluating Outreach Methods
- Creating Partnerships to Meet Outreach Goals
- Reaching Across Political and Cultural Boundaries
- Ways to Deliver Your Message
- Working with Local Officials
- And More!!

[For more information, visit the conference web site at www.epa.gov/OWOW/watershed/outreach/events/aprilconf.html or contact Stacie Craddock (craddock.stacie@epa.gov), U.S. EPA, at (202) 260-3788, or Melissa Bowen (bowenme@tetratech-ffx.com), EPA contractor, Tetra Tech, Inc., at (703) 385-6000.]

The Volunteer Monitor: 10 Years and Counting



The Volunteer Monitor, now in its 10th year of publication, is a free national newsletter highlighting watershed monitoring projects conducted by citizen volunteers. Each issue focuses on a theme, such as "Monitoring Wetlands," "Community Outreach," or "Restoration." The newsletter features practical how-to articles covering the wide variety of volunteer monitoring activities across the nation. Professionals and nonprofessionals alike find the articles useful and inspiring. Subscribers include volunteer monitors, teachers, government agency staff members, consultants, university professors, and community environmental groups. After reading the newsletter for the first time, one environmental consultant said, "I honestly had no idea how much good work was being done by volunteers. The articles are full of good and practical information." *The Volunteer Monitor* is published by River Network and supported by a grant from EPA's Office of Wetlands, Oceans, and Watersheds.

[For a free subscription, contact River Network, 520 Southwest 6th Avenue, Suite 1130, Portland, OR 97204-1535; volmon@rivernetwork.org. To suggest article ideas, contact the editor at (415) 255-8049; elliely@aol.com. The newsletter can also be found on the web at www.epa.gov/owow/volunteer/vm_index.html.]

Catalog of Federal Funding Sources for Watershed Protection (Second Edition)



In February 2000, the EPA Office of Water published the *Catalog of Federal Funding Sources for Watershed Protection* (Second Edition, EPA 841-B-99-003), a guide intended to inform watershed partners of federal monies that might be available to fund a variety of watershed protection projects. This version of the catalog updates the first edition published by EPA in 1997 (EPA-841-B-97-008).

For each of the funding sources the catalog contains a one-page fact sheet that indicates the types of projects funded and eligibility requirements. Contacts and web sites are provided for further information. This catalog lists federal sources that provide monetary assistance (grants, loans, cost sharing) and does not include sources that offer only technical assistance. In addition, the catalog does not contain information about small, site-specific federal sources or non-federal sources.

[The Catalog of Funding Sources for Watershed Protection, will be available for download soon from the Watershed Academy web site at www.epa.gov/OWOW/watershed/wacademy. For a hard copy, call the National Service Center for Environmental Publications (NSCEP) at (800) 490-9198 or (513) 489-8190; fax: (513) 891-6685.]

State of the North Carolina Coast



The North Carolina Coastal Federation has released its annual *State of the Coast Report* ranking the performance of coastal decision-makers and highlighting trends in coastal protection and growth management. Check it out on the Internet at nccoast.org, or call (800) 232-6210 for a free copy.

[For more information, contact Todd Miller, NC Coastal Federation, 3609 Hwy 24 (Ocean), Newport, NC 28570. E-mail: toddm@nccoast.org.]

New Report Compiles Data on Dam Removals

A new report released by American Rivers, Friends of the Earth, and Trout Unlimited documents more than 465 dams that have been removed across the country and includes detailed case studies of dam removal success stories. It is the most comprehensive review to date of the history and benefits of dam removal in the United States. It provides information on the ecological, safety, and economic benefits that accompany dam removals. Twenty-five case studies demonstrate dam removal success and the 26th case study (included as an appendix) discusses mistakes to avoid when removing a dam. The report asserts that in many cases where a dam's negative impacts on a river and riverside community outweigh the dam's benefits, dam removal can be a reasonable approach to restore the river and the community. Many dam owners have already chosen removal as the preferred alternative for hundreds of deteriorating, unsafe, or abandoned dams.

The report is based on data collected from state dam safety offices, federal agencies, river conservation and fishing organizations, dam owners, media reports, and academic institutions. It is available on American Rivers' web site at www.amrivers.org/successcontents.html.

[For more information, contact Margaret Bowman, Senior Director, Dam Programs, American Rivers, 1025 Vermont Ave., NW, Suite 720, Washington, DC 20005. Phone: (202) 347-7550, ext. 3016; fax: (202) 347-9240; e-mail: mbowman@amrivers.org.]

The Ecological Condition of Estuaries in the Gulf of Mexico

The Ecological Condition of Estuaries in the Gulf of Mexico is one in a series of "State of the Region" reports and represents a coordinated effort among personnel from the EPA's Office of Research and Development, U.S. Geological Survey Biological Resources Division, EPA's Gulf of Mexico Program, and EPA Regions 4 and 6. The report summarizes the condition or status, extent, and geographical distribution of ecological resources in the estuaries of the Gulf of Mexico. The report is based on data collected from a variety of federal, state, and local sources, notably EPA's Environmental Monitoring and Assessment Program (EMAP). It is designed to appeal to a broad audience of scientists, managers, and the public.

The report is organized in three parts: (1) an introduction to estuarine ecology and the factors that affect estuaries in the Gulf of Mexico, (2) an evaluation of ecological indicators used to measure the condition of gulf estuaries, and (3) an ecological report card summarizing data on ecological indicators and providing a rating of the condition of estuaries in each gulf state and for the gulf states overall.

[It is available on the Internet at www.epa.gov/ged/gulf.htm. It is also available from EPA's National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, (850) 934-9218.

New RBP Guide for Lotic Systems Available



Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers — Periphyton, Benthic Macroinvertebrates, and Fish (Second Edition, EPA 841-B-99-002) provides states with a practical technical reference for conducting cost-effective biological assessments of lotic (flowing water) systems. The protocols were designed as inexpensive screening tools to determine whether a stream is supporting a designated aquatic life use. They may also be appropriate for priority setting, point and nonpoint source evaluations, use attainability analyses, and trend monitoring. Worksheets are included. The protocols must be locally adapted and scaled.

[To order, contact Chris Faulkner, U.S. EPA, Assessment and Watershed Protection Division, 401 M Street, SW, Washington, DC 20460. Phone: (202) 260-6228.]

Bookmarks

Web Sites Worth a Bookmark

www.chesapeakebay.net

Check out the **Chesapeake Bay Program's** new web site. It's chock full of information about the bay and links to the sites of many Bay Program partners. You can find facts on animals and plants in the bay watershed, watershed profiles and water quality information, and publications on nutrients, toxic chemicals, and much more. You can even learn about the water quality of streams and rivers in your neighborhood.

www.stopnps.com

Through active involvement, mailings, and web sites, the **Nonpoint Source Pollution Prevention Initiative** hopes to educate watershed residents about nonpoint source pollution, offering new ways for residents to view and improve their surroundings, thereby improving the water quality in watersheds. This web site also posts advertisements for companies and organizations that support nonpoint source education. It is maintained by stopnps.com, Inc., which is based in Portland, Maine.

www.canr.uconn.edu/ces/nemo/index.html

Sponsored by the University of Connecticut's Cooperative Extension Program, NEMO, or **Nonpoint Education for Municipal Officials**, uses innovative techniques to teach local officials about the sources and impacts of nonpoint source pollution. The program provides presentations that include local photographs, educational materials, geographic information systems (GIS) images, and other information. NEMO's comprehensive web site provides basic information on nonpoint source pollution, detailed information on selected watershed projects, educational modules, and much more.

www.earthwater-stencils.com/index.htm

Earthwater Stencils has been designing, producing, and selling storm drain stencils since 1987. Earthwater Stencils believes public education is a valuable first step to raise citizens' awareness of the need for individual responsibility to prevent pollution. The web site provides step-by-step instructions on how to conduct a storm drain stenciling project. A variety of stencils can be ordered online.

The U.S. Geological Survey's **Science in Your Watershed** web site can help you find scientific information organized on a watershed basis. This information, coupled with observations and measurements made by watershed groups, provides a powerful foundation for characterizing, assessing, analyzing, and maintaining the status and health of a watershed. The web site has information on using GIS, active projects, case studies, and more.

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

March 2000

28-30

Managing Nutrients and Pathogens from Animal Agriculture, Camp Hill, PA. Contact NRAES, Cooperative Extension, 152 Riley-Robb Hall, Ithaca, NY 14853-5701. Phone: (607) 255-7654; fax: (607) 254-8770, e-mail: NRAES@cornell.edu; web site: www.NRAES.org.

April 2000

10

Stormwater Treatment Workshop, Lansing, MI. Contact Fred E. Cowles, P.E., Surface Water Quality Division, Michigan Department of Environmental Quality, PO Box 30273, Lansing, MI 48909-7773. Phone: (517) 335-4127; fax: (517) 241-8133; e-mail: cowlesf@state.mi.us.

17-19

National Watershed Outreach Conference, San Diego, CA. Contact Stacie Craddock, U.S. EPA, Ariel Rios Building, 1200 Pennsylvania Avenue, N.W., Washington, DC 20460. Phone: (202) 260-3788; e-mail: craddock.stacie@epa.gov.

25-27

National Water Quality Monitoring Council National Monitoring Conference 2000, Austin, TX. Contact GWPC at (405) 516-4972; e-mail: jeff@gwpc.site.net; web site: nwwqmc.site.net.

25-28

Enhancing the States' Lake Management Programs, Chicago, IL. Contact Bob Kirschner, Chicago Botanic Garden, 1000 Lake Cook Rd., Glencoe, IL 60022. Phone: (847) 835-6837; fax: (847) 835-1635; e-mail: bkirschn@chicagobotanic.org.

25-28

The 11th Global Warming International Conference and Expo, Boston, MA. Web site: www.GlobalWarming.net; conference fax hotline: (630) 910-1561.

26-29

6th National Volunteer Monitoring Conference, Austin TX. Contact Mary Crowe, Tetra Tech, 10306 Eaton Place, Suite #340, Fairfax, VA 22030. Phone: (703) 385-6000; fax: (703)385-6007; e-mail: crowema@tetrattech-ffx.com.

April 30–
May 4

Water Resources in Extreme Environments, Anchorage, AK. Contact Mike Kowalski, AWRA Director of Operations, 4 West Federal Street, P.O. Box 1626, Middleburg, VA 20118-1626. Phone: (540) 687-8390; fax: (540) 687-8395; e-mail: mike@awra.org.

May 2000

1-3

Sixth International Conference on Remote Sensing for Marine and Coastal Environments, Charleston, SC. Contact ERIM/Marine Conference, P.O. Box 134008, Ann Arbor, MI 48113-4008. Phone: (734) 994-1200, ext. 3234; fax: (734) 994-5123; e-mail: wallman@erim-int.com; web site: www.erim-int.com/CONF/marine/MARINE.html.

1-3

Water Resources in Extreme Environments, Anchorage, AK. Contact the American Water Resources Association, 4 West Federal Street, P.O. Box 1626, Middleburg, VA 20118-1626. Phone: (540) 687-8390; fax: (540) 687-8395; e-mail: info@awra.org; web site: www.awra.org.

4-5

Negotiating Effective Environmental Agreements, Berkeley, CA. Contact CONCUR, Inc. at (510) 649-8008; web site: www.concurinc.com.

16-25

Wildland Hydrology's River Short Courses 2000: Fluvial Geomorphology for Engineers, Pagosa Springs, CO. Contact Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Phone: (970) 731-6100; fax: (970) 731-6105; e-mail: wildlandhydrology@pagosasprings.net.

17-19

3rd National Mitigation Banking Conference, Denver, CO. Contact Terrene Institute, (800) 726-4853; www.terrene.org; terrinst@aol.com.

22-25

5th Annual U.S. EPA Region 6 Nonpoint Source Watershed Conference: Integrating Wetlands with NPS Issues, Angel Fire, NM. Contact Peter Monahan, New Mexico Environment Department, (505) 827-1041, email: peter_monahan@nmenv.state.nm.us, web site: www.nmenv.state.nm.us.

June 2000

- 21-24 *ASCE Watershed Management 2000 Conference: Science and Technology for the New Millennium*, Fort Collins, CO. Contact: dfrevert@do.usbr.gov.
- 26-30 *Wildland Hydrology's River Short Courses 2000: Applied Fluvial Geomorphology*, Pagosa Springs, CO. Contact Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Phone: (970) 731-6100; fax: (970) 731-6105; e-mail: wildlandhydrology@pagosasprings.net.

July 2000

- 9-12 *Coasts at the Millennium*, Portland, OR. Contact Laurie Jodice, The Coastal Society 17 Office, c/o MRM College of Oceanic & Atmospheric Sciences, Oregon State University, 104 Ocean Admin Building, Corvallis, OR 97331-5503. Phone: (541) 737-2064; e-mail jodicel@oce.orst.edu.
- 9-12 *WATERSHED 2000*, Vancouver, British Columbia. Contact The Water Environment Federation Member Services Center at 1-800-666-0206 or (703) 684-2452. E-mail: msc@wef.org.
- 17-21 *Wildland Hydrology's River Short Courses 2000: River Morphology and Applications*, Pagosa Springs, CO. Contact Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Phone: (970) 731-6100; fax: (970) 731-6105; e-mail: wildlandhydrology@pagosasprings.net.

August 2000

- 6-11 *Quebec 2000: 11th International Wetland/Peatland Meeting*, Quebec, Canada. Contact Elizabeth MacKay, c/o Quebec 2000, 2875 Boulevard Laurier, Bureau # 62Q, Delta II, Ste Foy, QC G1R 2B5. Phone: (418) 657-3853; fax: (418) 657-7934; e-mail: cqvb@cqvb.qc.ca; web site: www.cqvb.qc.ca/wetland2000.
- 14-18 *Wildland Hydrology's River Short Courses 2000: River Morphology and Applications*, Pagosa Springs, CO. Contact Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Phone: (970) 731-6100; fax: (970) 731-6105; e-mail: wildlandhydrology@pagosasprings.net.
- 21-25 *Wildland Hydrology's River Short Courses 2000: River Assessment and Monitoring*, Pagosa Springs, CO. Contact Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Phone: (970) 731-6100; fax: (970) 731-6105; e-mail: wildlandhydrology@pagosasprings.net.

September 2000

- 18-22 *Wildland Hydrology's River Short Courses 2000: River Morphology and Applications*, Pagosa Springs, CO. Contact Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Phone: (970) 731-6100; fax: (970) 731-6105; e-mail: wildlandhydrology@pagosasprings.net.
- 22-24 *Environmental Problem Solving with GIS*, Cincinnati, OH. Contact Lisa Enderle, (412) 741-5462, e-mail: lisa.e.enderle@cpmx.saic.com; web site: www.epa.gov/ttbnrml/.
- 25-29 *Wildland Hydrology's River Short Courses 2000: River Assessment and Monitoring*, Pagosa Springs, CO. Contact Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Phone: (970) 731-6100; fax: (970) 731-6105; e-mail: wildlandhydrology@pagosasprings.net.
- 27-29 *Alliance for Environmental Conservation: A Comprehensive Approach (to Nutrient Management)*, St. Louis, MO. Contact Wanda Linker, (334) 265-2732; e-mail: wanda@apea.the-link.net; web site: www.inform.umd.edu/manurenet.workshops/workshop.htm.

October 2000

- 10-19 *Wildland Hydrology's River Short Courses 2000: River Restoration and Natural Channel Design*, Pagosa Springs, CO. Contact Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Phone: (970) 731-6100; fax: (970) 731-6105; e-mail: wildlandhydrology@pagosasprings.net.
- 12-15 *National Small Farm Conference*, St. Louis, MO. Contact Dyremple Marsh, (573) 682-5550.
- 17-21 *Spanning Cultural and Ecological Diversity Through Environmental Education*, The 29th Annual Conference of the North American Association for Environmental Education, South Padre Island, TX. Visit www.naaee.org for more information.
- 26-28 *National Carbon Sequestrian Conference*, Missoula, MT. Contact Karen Reiter or Ted Dodge, (406) 587-6965; e-mail: kreiter@mt.nrcs.usda.gov.
- October 31–
November 4 *Combined Conferences of the American Society of Agronomy, Crop Science Society of America and Soil Science Society of America*, Salt Lake City, UT. Web site: www.asa-cssa-sssa.org/olr99/.

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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 that 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 or 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 (202) 260-3665 or (703) 548-5473 or FAX (202) 260-1977.

For additions or changes to the mailing list, please use the COUPON on page 31 and mail or fax it in. We are not equipped to accept mailing list additions or changes over the telephone.

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NONPOINT SOURCE

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