



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

Lessons Learned from the Local Level

by Ann Beier, Umatilla Basin Watershed Council Coordinator

After working on water issues at EPA in Washington, D.C., for six years, I moved to eastern Oregon, where I've spent the past six months working for a local watershed council. Since then, a number of folks have asked for my perspective comparing watershed issues at the local and federal levels.

I feel very fortunate to be in the position that I am. Oregon is perhaps unique among the states in that a state law authorizes the creation of local watershed councils. Perhaps more important, Oregon provides significant financial support to these councils and to watershed projects. The state commitment is matched by the local government effort. Watershed councils work to educate residents and to accomplish restoration and protection of watersheds at a local level. To do this, they need technical expertise, funding, and in some cases, regulatory provisions, from federal and state agencies.

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Here are some of the lessons I've learned in my short time working for the Umatilla Basin Watershed Council.

- **First, don't oversimplify.** Watershed issues are complex. Most watershed problems involve water, land, and other resources. More significantly, watershed issues involve people and how they manage and use those resources. When we deal with problems agency by agency or program by program, we sometimes oversimplify the issues. Particularly at the federal level, we tend to break off a little piece of the problem to analyze and then come up with a solution that addresses only that particular component. At the local level, it is easier to bring together the resource agencies and resource users to develop a more comprehensive strategy.
- **Second, cooperation is key to successful watershed projects.** The Umatilla Basin Watershed Council is fortunate to have support from a number of federal, state, tribal, and local agencies that have a long history of working together. We meet monthly for coffee and informal discussions where we resolve issues, come up with joint projects, establish trust, and learn about the operations of other agency programs.
- **Third, seek out new allies.** With agencies working cooperatively, there is an opportunity to reach out to diverse interest groups. We are tapping into local producer networks (Oregon Cattlemen, the Wheat League) as well as resource protection groups like Trout Unlimited. The local media are among our most valuable allies.
- **Fourth, educate people about their watershed.** I've had a number of opportunities to get out and talk to folks about watershed health. The more people understand the importance of water resources, the more they will support projects and funding. We built this support by holding a tour of our watershed from the headwaters in the national forest to the confluence with the Columbia River. We also spent half a day showing our state representative some in-stream projects in the Basin.
- **Fifth, money talks.** After they learn about local water resources, landowners may be interested in restoration activities. However, nothing seems to come cheap when working with landowners to change practices. Although most landowners want to do the right thing, many cannot afford the investment. Some landowners in our Basin entered into long-term agreements with local resource agencies to restore riparian habitat when incentives like fencing materials and labor were provided.

My experience in the Umatilla Basin has allowed me to see how efficiently and effectively things can be done at the local level, but I see, too, that water issues are so complex that all levels of government and a variety of private entities need to work together to address them.

Notes on the National Scene

Cooperative Program Testing the (Well) Waters

Do you know when your drinking water was last tested for contaminants? For many homeowners in rural areas who rely on private wells, the answer is when they purchased their homes. Knowing what to test for and where to find affordable testing are two obstacles homeowners face in protecting their drinking water supplies. A cooperative effort between the Water Quality Laboratory of Heidelberg College in Tiffin, Ohio, and the American Farm Bureau Federation is providing help — though a planned, cost-effective water testing program.

The impetus for the Cooperative Private Well Testing Program dates from a 1986 American Farm Bureau Federation National Leadership Conference that revealed a lack of available well water data. According to Jim Porterfield, a natural resource specialist with the American Farm Bureau Federation, "Most states had almost no data on well water quality at a time when groundwater policies were being debated in the mid-1980s." Representatives of the Ohio Farm Bureau were concerned about what they learned at the conference and approached Dave Baker of Ohio's Heidelberg College Water Quality Laboratory for assistance in conducting a well water testing program.

Now the Cooperative Private Well Testing Program has expanded from its Ohio origin and is conducted throughout the nation on a county or regional basis with the assistance of one or more local sponsoring organizations. Typically, county Farm Bureau offices, soil and water conservation districts, and county Extension offices serve as sponsors. The sponsoring organization plans, advertises, oversees, and collects fees for the program.

Several affordable water testing packages are offered. The nitrate package tests for nitrate, nitrite, ammonia, chloride, sulfate, soluble phosphorus, silica, and specific conductivity, and provides well owners with an overall picture of their well water quality for approximately \$12. Screening for four different types of pesticides is available for \$15 per test; and a package that tests for 23 metals, including lead and arsenic, for \$50. Screening for volatile organic chemicals rounds out the testing program with a package that tests for 46 substances, such as petroleum products and solvents, for \$25.

The Heidelberg College Water Quality Laboratory provides test kits to the sponsoring agencies. Local residents purchase the kits and collect their own water samples, returning them to designated drop-off points. If the sponsor wants the lab to create maps indicating areas of elevated nitrate and pesticide concentrations, then a map is placed at each collection site for participants to mark the approximate location of their wells.

The sponsoring agency collects, packages, and returns the test kits to the lab in Ohio. Within four weeks, participants receive a copy of their well's analysis with a letter relating the results to existing primary and secondary drinking water standards or health advisory levels. The sponsoring agency receives a summary of test results, although the summary is designed to protect the privacy of participants. The lab also creates nitrate and pesticide indicator maps for sponsors who elect this option. Sponsors often use the maps at follow-up meetings to discuss overall results, recommend courses of action for correcting problems, and answer questions.

Since 1987, when the Cooperative Private Well Testing Program began, over 43,000 residents in 372 counties and 17 states have submitted water samples to the Heidelberg College Water Quality Laboratory for testing. Although available to localities across the nation, a five-state midwestern region, including Ohio, Indiana, Illinois, Kentucky, and West Virginia, has had the most participation.

The cooperative well testing program provides an affordable avenue for private well owners to ensure the safety of their drinking water. Porterfield adds, "These aggregate data are very useful in sorting through state policy options as well as benefiting the individual." Organizations interested in sponsoring the program in their area can obtain a brochure and an informational video from the American Farm Bureau Federation.

[For a free brochure on the Cooperative Private Well Testing Program, or a copy of the 11-minute video for \$15, contact Jim Porterfield, American Farm Bureau Federation, 225 Touhy Avenue, Park Ridge, IL 60068. Phone: (312) 399-5782. For more information on water testing methods, contact Dave Baker or Nancy Creamer at the Water Quality Laboratory, Heidelberg College, 310 East Market Street, Tiffin, OH 44883. Phone: (419) 448-2198.]

Preventing Rural Water Pollution: FARM*A*SYST and HOME*A*SYST

Interest in expanding the Farm*A*Syst National Program is high and continues to grow.

Both the Farm Assessment (Farm*A*Syst) and Home Assessment (Home*A*Syst) systems are cost-effective, voluntary pollution prevention programs. Each one provides pollution risk assessment tools and a flexible implementation framework. Rural residents use assessment worksheets to identify pollution risks from a wide range of farm and home structures and management practices, then use fact sheets and technical referrals to develop site-specific, voluntary action plans to prevent pollution.

Because Farm*A*Syst and Home*A*Syst have simple yet versatile formats, agencies, private sector organizations, and schools can easily adapt them to whole-farm and home environmental risk management needs. They have been used effectively as a stand-alone program and as part of targeted water quality projects.

Farm*A*SYST and Home*A*SYST coordinators are surveyed each year about the status of their programs. So far, 50 states have named Farm*A*SYST and Home*A*SYST Program coordinators; 25 states have completed modification of assessment materials; and 16 states, Puerto Rico, and the Virgin and Pacific Islands are developing assessment materials. In all more than 12,000 farmstead pollution risk assessments have been conducted, and pilot evaluations have been completed in 10 states.

The most common high risks identified in farmstead assessments in pilot projects involving 214 sites in three states are petroleum handling and storage, pesticide handling and storage, household wastewater disposal, and well design and management.

Participants of pilot evaluations in the United States and Canada say the program is useful and that they would recommend it to their neighbors. Participants say they can nearly always identify one or more high risks, make low-cost management changes almost immediately, and plan to make higher costing structural changes in the future.

Integration with Other Programs

Farm*A*SYST integrates the resources of all levels of government and the private sector to develop proactive, cooperative programs to address pollution concerns. The flexibility of Farm*A*SYST and Home*A*SYST is illustrated by the extent to which they have been integrated into other programs. Farm*A*SYST is being used in more than 45 of the 90 USDA Hydrologic Units and Water Quality Demonstration Projects, and in 23 state nonpoint source pollution programs using EPA section 319 funding. The program is also used in conjunction with Resource Conservation and Development projects and Pub. L. 566 watershed plans. Spanish translations of the program are being developed along with other curriculum planning, and both AmeriCorps staff and the private sector have or will be involved in Farm*A*SYST program delivery.

*[For more information on Farm*A*SYST and Home*A*SYST, contact the Farm*A*SYST National program, B142 Steenbock Library, 550 Babcock Drive, Madison, WI 53706-1293]*

Federal Government Recycling Common NPS Contaminant — Engine Coolants

Effective May 1, 1996, all federal agencies and state and local agencies using federal funds are required to use recycled engine coolant and to purchase other designated items made from recycled materials.

"The Comprehensive Guideline for Procurement of Products Containing Recovered Materials; the Final Rule" was published in the *Federal Register* on May 1, 1995. The guideline lists 19 new items and incorporates five previously designated items. Engine coolants, a potential contaminant in urban runoff, are on the list.

Engine coolants provide protection against boiling, freezing, and corrosion, but in use they lose some measure of these functions from the accumulation of contaminants and the depletion of additives such as corrosion inhibitors. The recycling process attempts to restore these functions to standards specified for unused coolant.

Annually, more than 200 million gallons of engine coolant are sold in the United States. After purchase, engine coolant is diluted 50 percent with water before being added to an engine. Thus, as many as 400 million gallons of spent engine coolant mixtures may require disposal each year. If not recycled, the spent coolant is usually disposed of in a sewage treatment system or managed as a hazardous waste. Often it is dumped on the ground or into storm sewers where it finds its way into surface water.

According to Rod Frederick, Urban Sources Section Chief of the Nonpoint Source Control Branch of EPA, "The effect of this rule is expected to be an increase in the availability of drop-off centers for recycling used antifreeze. This method is a much better alternative than flushing it to sewage treatment plants or placing it in indefinite storage."

[For more information, contact the RCRA Hotline 1-(800) 424-9346.]

Urban Runoff Notes

Maryland Developer Grows "Rain Gardens" to Control Residential Runoff

Somerset, an 80-acre site being developed into 199 homes on 10,000-square-foot lots, with prices starting around \$160,000, sounds like a typical modern subdivision — that is, until you see it. When you drive into Somerset in Prince George's County, Maryland, you notice something different. The roads blend into grassed swales. Homes sit on large lots at refreshing angles, and each home has carefully placed landscaping. The subdivision creates a sharp contrast with the curbs, gutters, and sidewalks that frame neighboring communities. It is difficult, at first, to identify what makes Somerset so different, but it revolves around a special feature known as Rain Gardens.

Rain Gardens — A Pilot at Somerset

Rain Gardens are an alternative stormwater management practice being applied as a pilot project at Somerset. The Gardens are a combination of grasses, shrubs, and trees that serve as ground cover, a middle story, and a canopy in simulation of a forest environment. The shallow, landscaped gardens manage stormwater through bioretention, combining physical, biological, and chemical processes to maximize pollutant removal. The settling of sediments in shallow pool areas, the natural processes of plants and microbes, and chemical reactions occurring in the soil allow the gardens to absorb and purify stormwater runoff. Rain Gardens restore the functions of wooded wetlands removed by land development and the construction of conventional dry and wet BMP ponds.

Each Somerset lot has a Rain Garden, 300 to 400 square feet in size. The gardens are located at low points on the lots and take different shapes. A six-inch basin excavated in each garden allows water to pool on top of a layer of mulch for no more than 48 hours after a rain event. Originally it was believed that evapotranspiration would be a primary mechanism for moving water out of the system, but, says Larry Coffman, associate director for programs and planning with the Prince George's County Department of Environmental Resources, "infiltration turns out to be the most significant mechanism for dewatering the system." Because the evapotranspiration rate exceeds the amount of precipitation in the region during the summer months, the plants selected for the Rain Garden must tolerate both wet and dry conditions.

How It All Began

The use of bioretention for stormwater management originated at commercial and industrial sites where space is limited, and the installation and maintenance of conventional BMPs, such as oil and water separators and stormwater ponds, is expensive. An effort was made at these sites to make landscaped areas more functional by lowering elevation, allowing water to pool for a short time before infiltrating the soil.

The residential application of bioretention for stormwater management took shape at a conference when developer Dick Brinker approached Coffman to discuss replacing the four conventional BMP ponds required at Somerset with bioretention facilities. Although plans for Somerset had already been drawn, Coffman, Brinker, and Brinker's daughter Theresa, president of the TABCO land development company, went back to the drawing board. They replaced conventional BMP ponds, curbs, gutters, and sidewalks with bioretention gardens on each lot, and created open drainage swales and wider roads to accommodate pedestrian traffic.

The result was a reduction in infrastructure and construction costs that would facilitate the cost-effective development of the subdivision, attempts at which had ended in bankruptcy on three previous occasions. Hanifin Associates, consultants to Prince George's County, dubbed the stormwater facilities "Rain Gardens." Coffman credits TABCO with providing the impetus for the Rain Gardens pilot, saying, "I don't think that we could have done it without the support of the developer. They were committed to the concept as a more environmentally sensitive — and less expensive way — to develop the site."

A Cost Advantage

Coffman worked with local agencies to develop the Rain Gardens plan for Somerset. The local transportation department required that the roads be constructed 10 feet wider than usual

because of concern that people would park cars along the road and potentially damage the grass swale drainageways. The extra road surface, combined with a network of trails, will serve as a walkway through the community. Even with this added expense, Rain Gardens is proving to be a cost-effective stormwater management strategy. Each garden costs approximately \$500: \$150 for excavation and \$350 for plants. Approximately \$100,000 will be required to fully implement Rain Gardens at Somerset, in comparison to a cost of nearly \$400,000, not including the expense of curbs, gutters, and sidewalks, for the conventional BMP ponds originally planned.

Somerset's naturally sandy soils are providing another cost savings, serving as the sand base specified by the Rain Garden design to allow infiltration. Topsoil from excavated areas on-site is being applied in the gardens and will provide wet storage during rainfall events. The use of Rain Gardens as stormwater management facilities also offers room for TABCO to add six or seven lots to Somerset, aiding the developer by generating additional revenue to offset costs. The gardens may even be a key to successful sales. Theresa Brinker observes, "Sales are above average for that general market corridor. Buyers perceive the gardens as an added value to their home." Additional cost savings for future Rain Garden applications may be realized through a waiver of wetland impact fees and requirements for street trees and landscaping.

In contrast to the cost-effectiveness of Rain Gardens, conventional BMP ponds designed to control 2-, 10-, and 100-year storms are often prohibitively expensive. In addition, stream degradation and streambank erosion can continue to occur with these types of BMPs. Rain Gardens are designed to mimic predevelopment conditions and should be able to maintain the predevelopment hydrograph for all storm events, Coffman says. "We think under some circumstances it is even possible that if you have enough space and the right soils, you can bring the hydrograph back down to levels below predevelopment so that you get less runoff from the developed site than you would from a forested condition."

Rain Gardens also provide recharge for adjacent streams and help retain baseflow in wetlands. Coffman emphasizes, however, that Rain Gardens are a BMP tool that may need to be modified in areas where infiltration is undesirable, such as areas in close proximity to sensitive recharge zones or those with unstable soil conditions. In these situations, Rain Gardens would have to be implemented as a filtration — rather than an infiltration — system, allowing water to "biofilter" through the gardens into an underdrain and to a discharge point.

Homeowners Maintain Stormwater Facilities

Homeowners play a critical role in maintaining the function of Rain Gardens. They learn the purpose of their gardens through an informational brochure and manual. The manual, adapted from the "Prince George's County Design Manual for Use of Bioretention in Stormwater Management" provides information on plants that can be used in Rain Gardens, and describes how to specialize the gardens to enhance habitat for wildlife, or to add color and texture. Prince George's County provided funding for the development of the brochure and manual and plans to hold workshops with the residents of Somerset on subjects such as garden maintenance and lawn care.

Each Somerset homeowner signs an agreement acknowledging that they are aware of the function of the bioretention facilities. The Home Owner's Association maintains the common area Rain Gardens and ensures that homeowners maintain their individual gardens. The gardens were designed so that they do not require fertilizer or pesticides. Maintenance consists of weeding, pruning, and replacing plants.

By eliminating the public burden of maintaining stormwater management ponds and pipe systems, Coffman hopes to obtain a 50 percent reduction in stormwater taxes. This reduction could translate into a cost savings of \$100 to \$200 per year for county residents who maintain Rain Gardens.

Looking Forward

Prince George's County will use \$150,000 of EPA Section 319 funds to monitor surface and groundwater quality at Somerset over the next two years. The U.S. Fish and Wildlife Service will help monitor stream channels. Physical, biological, and chemical data will be used to compare the application of Rain Gardens in Somerset with a subdivision using conventional BMPs.

Bioretention Manual Available

Copies of the "Prince George's County Design Manual for Use of Bioretention in Stormwater Management" are currently available. The manual, published in June 1993, provides information on bioretention, specifically grading; planting; soil, mulch, and plant material guidelines; maintenance; and runoff control. Although it was produced with commercial and industrial applications of bioretention in mind, information contained in the manual can be adapted to residential applications. To obtain a copy of the manual, send \$20 to the Prince George's County Department of Environmental Resources, 9400 Peppercorn Place, Suite 600, Landover, MD 20785.

Rain Gardens are a step toward low-impact development that, according to Coffman, "combines environmentally sensitive site design with pollution prevention to form a comprehensive approach to water quality problems." The gardens can be applied in many geographic areas by adapting plants suited to each region. The benefits of applying the Rain Gardens concept for stormwater management will likely be realized in more subdivisions in the future, driven by both their positive environmental effects and their economic advantage.

[For more information, contact Larry Coffman, Prince George's County Department of Environmental Resources, 9400 Peppercorn Place, Suite 600, Landover, MD 20785. Phone: (301) 883-5926.]

Card Carrying Contractors Control Construction Compliance

On Maryland construction sites, crew members focus on the project schedule, material orders, the condition of equipment, safety, and who has the Green Card.

Since 1980, possession of a Green Card has meant that a worker has attended the Green Card erosion and sediment control training seminar and successfully completed the certification exam. To ensure that quality erosion and sediment control is implemented on construction projects, the Maryland Department of the Environment (MDE) requires that at least one person on every construction site possess a Green Card.

More than 7,000 people have been certified in erosion and sediment control since the inception of the program.

How to Get Green

Two environmental specialists with the MDE conduct the free 3.5 hour Green Card training seminars. Personnel in several Maryland counties have also been certified by MDE trainers to provide the training in their jurisdictions. Centered around erosion control and the negative impacts of sedimentation, the training alerts participants to potential erosion issues such as sediment flow to a storm drain inlet and how inlet protection is used as a control measure. On-site training is provided by request for companies with 15 or more employees. Maryland field offices of the USDA Natural Resources Conservation Service and Maryland Conservation Districts provide input to the training program.

Offered during the winter months at a time when the participants' workload is light, the program caters primarily to earth-moving contractors, but it has also been conducted for private building companies, land development and engineering companies, the National Parks Service, and others.

In 1995, 1,350 people have been certified as a result of 35 seminars. Currently, MDE does not require recertification, although many Green Card holders attend additional training seminars to update their skills.

Erosion and Sediment Inspection Encourages Employers

Proactive Maryland erosion and sediment control inspectors have influenced the success of the Green Card program. Although small construction projects are not monitored closely, project managers are still obligated to abate sediment pollution. Persistent inspectors who observe problems at small sites encourage companies to go the extra mile to safeguard their projects from enforcement action.

One participant is Baltimore Gas and Electric (BGE), a Maryland utility company that frequently conducts projects under the 5,000 square foot or 100 cubic yard area requiring erosion and sediment control plan approval. BGE has taken an active role in erosion and sediment control; for example, it approached the MDE to inquire about having a staff member certified to provide Green Card training and certification within the organization. Now BGE trains its own employees and reports the number of individuals earning Green Cards each quarter. BGE expanded its role in the program by coproducing a 28-minute video on erosion and sediment control with the MDE. The cooperative effort allowed the MDE to produce a much-needed resource at low cost.

Getting the Job Done Right

Marty Hill, a Green Card holder and the owner of Maryland's Masonry Contractors, says that his company tries "to get as many people certified as we can, including anyone with a role in construction involving grading, sediment control, and management of the site." Approximately

20 employees of Masonry Contractors have earned Green Cards. Hill observes that the program helps employees "understand why they are doing it [erosion control] and what they are trying to accomplish. If you understand why you're doing it, you are more likely to do it and do it right." Knowing what to do and how to do it right ensures proper erosion and sediment control and strengthens communication between construction companies and local program officials.

The Maryland Green Card program offers a conduit for effective communication between state and local officials who enforce erosion and sediment control requirements and earth-moving contractors who implement these requirements at active construction sites. The Green Card program has been successfully applied in Delaware as well as Maryland and may prove to be the ideal solution for improving erosion and sediment control at urban construction projects in other areas.

[For more information, contact Rick Trickett, Maryland Department of the Environment, 2500 Broening Highway, Baltimore, MD 21224. Phone: (410) 631-3543.]

In Michigan, Golf Club Begins Second Year with Steadily Improving Water

Reprinted from *Water Resources Review*, June 1995, published by the Water Resources Institute at Michigan's Grand Valley State University.

While everyone's golf score may not have decreased during the 1994 golfing season, water pollution indicators monitored at the Meadows Golf Club demonstrated a steady decline since construction of the new golf facility began nearly four years ago.

The Meadows Golf Club, built to model sound environmental practices, finished its first year of operation in November of 1994. Water quality monitoring by the Water Resources Institute (WRI) indicates a steady decline in the amount of nitrates, phosphates, suspended and dissolved solids, and ammonia exported from the golf course wetlands and into the Grand River over the past three years.

A large part of the success in preserving water quality at the Meadows has come from land stabilization. Vegetation buffer zones, established along sensitive wetland areas, have served in reducing nutrient runoff into the waterways.

The Meadows has the unique ability to use the wetlands located throughout the course as biological filters. These wetlands trap and remove nutrients that are often responsible for water quality degradation. As an example, nitrates entering the golf course through groundwater sources are reduced by one half before they exit into Ottawa Creek and subsequently the Grand River.

In 1995, WRI will be working to assist the golf course in developing a management program which will increase fertilizer and pesticide efficiency within localized areas of the course. This approach requires the identification of individual geographic areas where fertilizers and pesticides are more susceptible to leaching and where these materials are retained for greater utilization. "Fertilizers and pesticides that quickly leave the system threaten the environment and waste money," says WRI project manager Jeff Cooper. "The goal is to reduce chemical usage while maintaining a high quality golf course and good water quality at the Meadows."

[For more information about the ongoing water quality study at the Meadows Golf Club, contact Project Manager Jeff Cooper, Grand Valley State University, One Campus Dr., Allendale, MI 49401. Phone: (616) 895-3271. Or contact Meadows Golf Club Superintendent Kathy Antaya at (616) 895-1005.]

Notes on the Agricultural Environment

Working with Local Producers to Develop Localized BMPs

When the Colorado legislature passed a 1990 bill protecting groundwater and the environment from the improper use of agricultural chemicals, the challenge was to achieve this by changing chemical use practices through education. The result is that BMPs in Colorado are now being developed largely at the local level.

For about two years, small groups of 10 to 15 agricultural chemical users — producers, chemical applicators, and other experts in the local watershed — have been working together to develop comprehensive sets of BMPs that are technically feasible, economically acceptable, and achieve state water quality goals. The producers participating in the work groups demonstrate the successful use of BMPs on their farms and foster support for the voluntary approach.

Said Lloyd R. Walker, an agricultural engineer, and Reagon M. Waskom, a water quality specialist — both with Colorado State University's Extension Service — "Initially, we were concerned that practices developed by local producers would address mainly the status quo with no real impact on groundwater protection. However, producers have taken an aggressive approach toward voluntary practices, realizing that they are preferable to mandatory regulations."

The process is a creative one. Colorado State University Cooperative Extension (CSUCE) involves agricultural chemical users in developing and implementing BMPs that are sensitive to local conditions.

CSUCE provides technical expertise and acts as the catalyst and driver of the process. Local agricultural producers serving on the BMP work group act as reviewers, contributors, and supporters of both the process and the end product.

Cooperative Extension agents facilitate the partnership and create the right climate for productive group dynamics. The agents' first and most important task is to assemble a group of innovative producers willing to participate in the process. "The importance of this cannot be overemphasized," said Walker and Waskom. "The group's productivity is directly related to the care in assembling it." The work group is limited to 15 members, drawn mostly from local agricultural organizations (i.e., irrigation districts, soil conservation districts, etc.). Certified organic growers and producers employing holistic resource management techniques to

production agriculture are also sought to represent alternative approaches. Some groups also include limited participation by nonproducer interests like crop consultants, the agricultural chemical industry, and Natural Resources Conservation Service staff.

"The most important assets work group members bring to the process are their experience and ties to the agricultural community. This experience, combined with a commitment to the process of adopting BMPs, is the key to developing localized BMPs," said Walker and Waskom, emphasizing that the BMP work group is producer-driven, and nonproducer interests play only a supporting role.

Tempering Research with Practicality

The group begins by exploring research-based BMPs and identifying appropriate practices for their local circumstances. For example, a first task may be to address nutrient management BMPs or a specific crop for pest management BMPs. The end product is a set of practices that tempers research-based knowledge with the practical realities faced by producers.

As the BMPs are reviewed and revised for the local area, Extension specialists edit them and incorporate the local perspective, until consensus is reached. Specialists challenge the local producers to think creatively by sometimes suggesting practices outside the norm. In turn, producers identify useful local practices overlooked by the specialists.

The product of the deliberations, a set of local BMPs, is published as a local BMP brochure, but the task does not end there. The next phase is getting the localized BMPs on the ground.

As innovative producers, the work group members are usually highly respected in the community. When they speak, other producers tend to listen. The work group members use formal and informal settings to share information. Word gets out through the local media, meetings, demonstrations, and field days.

The localized BMP project has produced the following publications:

- Best Management Practices for Colorado Agriculture: An Overview (Bulletin No. XCM-171)
- Best Management Practices for Nitrogen Fertilization (Bulletin No. XCM-172)
- Best Management Practices for Irrigation Management (Bulletin No. XCM-173)
- Best Management Practices for Manure Utilization (Bulletin No. XCM-174)
- Best Management Practices for Phosphorus Fertilization (Bulletin No. XCM-175)
- Best Management Practices for Pesticide and Fertilizer Storage and Handling (Bulletin No. XCM-178)
- Best Management Practices for Agricultural Pesticide Use
- Best Management Practices for Crop Pests
- Best Management Practices for Private Well Protection
- Best Management Practices for Irrigated Agriculture—A Guide for Colorado Producers Best Management Practices for Nutrient and Irrigation Management in the San Luis Valley

To order, contact Lloyd R. Walker
Phone: (970) 491-6172

Three groups are now functioning: one in the San Luis Valley is focusing on nutrients; a second in the same local area is targeting pest management; and a third group is working on BMPs for irrigated lands in the South Platte River Basin.

[For more information, contact Lloyd R. Walker, Extension Agricultural Engineer, Departments of Chemical and Bioresource Engineering, Colorado State University, Fort Collins, Colorado 80523. Phone: (970) 491-6172; Fax: (970) 491-7369.]

Virginia Poultry Companies Require Nutrient Management Plans

In a landmark initiative, the Virginia Poultry Federation has announced a new policy to protect water quality. The four major integrated poultry companies in Virginia (WLR Foods, ROCCO, Tyson Foods, and Perdue Farms) will require new growers in all counties to have a nutrient management plan before beginning operation, according to Federation President John Johnson. The industry's long-term goal is to have all growers operating with nutrient management plans, as soon as the plans can be developed by state agencies. The Federation's previous policy required plans only when counties called for them.

Virginia Commissioner of Agriculture J. Carlton Courter III hailed the announcement, saying, "Farmers are good stewards of the land and water, and I think the commitment clearly demonstrates this. These poultry producers are willing to put in writing how they will protect the environment."

The announcement followed meetings between Virginia Secretary of Natural Resources Becky Norton Dunlop, industry, and local government officials relating to the development of tributary strategies for nutrient reduction in the Chesapeake Bay.

Use of nutrient management plans is a major component of efforts to restore the water quality of the Chesapeake Bay. Under a nutrient management plan, poultry litter is tested for its fertilizer value and applied to cropland at specific rates corresponding to crop needs. This practice helps reduce the amount of nitrogen and phosphorus that washes off the land into the rivers and Bay. Moira Croghan, of the Virginia Department of Conservation and Recreation, reported that nutrient management specialists have already developed more than 1,300 site-specific nutrient management plans on 338,000 acres of cropland. Estimated nutrient use reductions from their application equate to 8.2 million pounds of nitrogen and 8.0 million pounds of phosphate — or roughly \$3.6 million in fertilizer nutrient reduction.

Johnson added that the industry realizes that nutrient management not only helps protect water quality, but increases farm efficiency. "This is a win-win situation where farmers can cut costs and protect the environment. Nutrient management planning is a clear demonstration of the good stewardship practiced by poultry producers," he said.

[For more information, contact John Johnson, Virginia Poultry Federation, P.O. Box 552, Harrisonburg, VA 22801. Phone: (703) 433-2451. Or contact Moira Croghan, Manager, Bureau of District and Landowner Assistance, Division of Soil and Water Conservation, 203 Governor Street, Suite 206, Richmond, VA 23219-2094. Phone: (804) 786-3958.]

Well Water Analysis Reveals Minimal Nonpoint Source Impacts

A recent analysis compiled under the joint Farm Bureau Federation/Heidelberg College Cooperative Private Well Testing Program provides insight into rural well water quality and factors affecting water quality in 34,759 wells and springs in a five-state midwestern region (see this issue, page 2). Data submitted voluntarily by well owners in Ohio, Indiana, Illinois, Kentucky, and West Virginia were used in the analysis.

According to the Water Quality Laboratory of Heidelberg College in Tiffin, Ohio, contaminant levels in excess of EPA Maximum Contaminant Level health standards (10 parts per million [ppm] for nitrate-nitrogen and 3 parts per billion [ppb] for atrazine) were detected in 3.4 percent of nitrate samples and 0.1 percent of atrazine herbicide samples. The lab cites a U.S. Geological Survey convention that suspects human influences when nitrate-nitrogen

concentrations exceed 3 ppm. Nitrate-nitrogen concentrations were less than 3 ppm in 84 percent of the wells tested in the study.

The most commonly detected pesticide product in the samples was ethane sulfonate, a breakdown product of the herbicide alachlor. This breakdown product is considered nontoxic by EPA, said Dave Baker of the Heidelberg College Water Quality Laboratory.

The lab also studied the location of nitrate and pesticide concentrations, and although most of the maps showed a random distribution, there were some links to local geology. For example, some river valley aquifers and karst areas had higher nitrate levels than adjacent areas. The lab also discerned that pesticides, especially the alachlor by-product ethane sulfonate, were indicated more frequently in some areas of sandy soils and shallow water tables.

Using the responses of well owners to questionnaires returned with water samples, the lab also identified connections between water quality data and well characteristics. Comparisons revealed that nitrate, and often pesticide, concentrations were significantly higher in

- older or shallow wells,
- wells that have gone dry in the past,
- wells with no casing or a casing that does not extend above ground level,
- wells in sandy soil, and
- wells close to croplands or barnyards.

"In addition to providing many individuals with information concerning their well water, Baker said, "the large size of the database supports statistical confirmation of many of the expected relationships between vulnerability factors and well contamination."

The analysis also revealed that wells used for domestic purposes yielded lower nitrate and pesticide levels than those used for livestock or irrigation. According to the lab, factors that had no relationship to concentrations, or only a weak one, included proximity to chemical dealerships, landfills, hazardous waste sites, and rivers or streams. Despite generalizations offered by the study, Baker emphasized that "there's no substitute for testing your well!"

[For more information, contact Dave Baker or R. Peter Richards at the Water Quality Laboratory, Heidelberg College, 310 East Market Street, Tiffin, OH 44883. Phone: (419) 448-2198.]

News from the States, Tribes, and Localities, Where the Action Is

Tree Planting Program Completes Its First Year — Offers Help to Ohio Landowners

Tree plantings, from Johnny Appleseed until now, have had both practical and symbolic meaning. Planted beside running water, trees are a symbol of shelter, nourishment, and strength. More than that, they improve water quality, offer habitat, help control erosion, and in some cases provide income, among other benefits.

So "Should we plant trees?" is not the question. Instead, landowners are more likely to ask, "Who has the time, and who will do the work?"

In Ohio, help is available from TREES — the Tree Resource Establishment and Enhancement Service, a cooperative program of the Ohio Department of Natural Resources (ODNR) Office of Forestry and the Top of Ohio Resource Conservation and Development (RC&D) Council. TREES is a contract service to help landowners plan and maintain healthy trees on their land.

The program is as simple as the need for it is strong. The landowner, in consultation with the ODNR forester, makes a plan for the tree planting, determines the number of acres to be planted, and signs a contract with the RC&D Council for a three-year term. The RC&D Council then hires a vendor who will plant and maintain the trees during that time. The landowner pays a flat fee to the RC&D Council for this service. In some cases, cost-share programs are available to help the landowner defray costs. The ODNR forester can provide information about these possibilities.

"We have completed our first planting season," said ODNR Forester Kathy Smith, "and we are very pleased with the program. We planted 21 acres this first year, and we had many out-of-state calls for information."

The biggest problem, Smith said, is finding a permanent vendor to handle the contracts. This year, the program operated along the Mad River and in the Indian Lake and Stillwater watersheds, but next year, added Smith, "we expect to do even more." She noted the great opportunity that exists for plantings, "especially along the edges of fields included in the Conservation Reserve Program."

Steps Needed to Establish a Healthy Stand of Trees

TREES helps the landowner tackle the many technical questions that arise before tree plantings can be undertaken. The most obvious questions concern site preparation and maintenance planning, and protective measures to ensure that wildlife will not damage the young trees. "We also have to assure landowners that the trees will not attract too many deer," Smith said.

TREES supports three types of tree plantings:

- block plantings for erosion control, wildlife habitat, aesthetics, and income;
- filter strips for improved water quality, sediment control, erosion control, aquatic habitat, income, wildlife habitat and wetlands protection; and
- windbreaks for soil conservation, energy conservation, livestock protection, aesthetics, wildlife habitat, and increased crop yields and quality.

The vendor works according to the plan devised by the landowner and the ODNR forester. The minimum contract includes site preparation, tree seedlings, plantings, two maintenance mowings in the first year, and three maintenance mowings in the second and third years. Tree shelters may also be provided, though this service involves an additional per-acre fee.

Many organizations are able to involve citizens in annual tree planting ceremonies because the approach is simple and the symbolism clear. However, properly planning and maintaining an entire stand of trees as a way to restore or enhance wooded areas or to help control nonpoint source pollution along streams requires a commitment of time and a degree of digging that is often beyond an individual's ability. Ohio's TREES is a partnership between landowners and natural resource agencies that overcomes this difficulty.

[For more information, contact Kathy Smith, ODNR Forester, Ohio Department of Natural Resources Office of Forestry, 304 Patrick Avenue, Urbana, Ohio 43078. Phone: (513) 653-4106.]

EPA and University of Maryland Run Financial Management Center

Increasingly, communities across the country face rising environmental costs and the pressure of inadequate funds. To address these environmental and financial concerns, the University of Maryland's Coastal and Environmental Policy Program, with support from the U.S. EPA, sponsors the Environmental Finance Center.

The Center promotes alternative and innovative ways to manage the cost of environmental activities, provides training, and works to increase the public and private sector's awareness of the benefits associated with sound environmental management policies.

The Center's comprehensive and integrative approach to environmental finance stems from a strategic management perspective that encompasses a broad spectrum of activities. Needs assessments, issue prioritization, identification of relevant environmental regulation and compliance issues, development of capital facilities plans, identification of revenue sources, and community participation are precursors to securing financing.

In addition, the Center is a repository and clearinghouse for environmental finance-related information from EPA, the Environmental Financial Advisory Board (EFAB), and the Environmental Financing Information Network (EFIN) as well as other environmental finance centers across the nation.

The Center carries out four major interrelated initiatives:

- technical assistance and support to enhance the capacity of state and local agencies to meet and successfully implement environmental goals and regulations;

- training and curriculum development opportunities through established educational and environmental leadership programs for students, mid-career executives, and senior executive professionals;
- public information and outreach designed to increase awareness of sound environmental planning and implementation practices; and
- information sharing and materials development.

[For more information, contact Elizabeth Hickey, Coordinator, Environmental Finance Center at the University of Maryland, 0112 Skinner Hall, College Park, MD 20742. Phone: (301) 405-6383; Fax: (301) 314-9581.]

InterTribal Sinkyone Wilderness Park — California's Coastal First

A partnership of agencies and organizations is trying to return 3,900 acres of Northern California coastal forest to the stewardship of Native Americans and restore the mature mixed redwood and Douglas fir forest.

Located in Mendocino County north of Fort Bragg, the area has been heavily logged over the past 40 years and resulting erosion has clogged streams, all but eliminating native salmon and steelhead trout. Recently, the InterTribal Sinkyone Wilderness Council has undertaken stream improvement, tree planting, removal of old logging roads, and watershed and forestry stewardship planning projects on the parcel and in the adjacent state park.

The entire tract of 7,100 acres was purchased by the California State Parks, Save the Redwoods League, the California Coastal Conservancy, and the Trust for Public Land. About 3,200 acres were added to the adjacent State Wilderness Park. The Trust for Public Lands owns and administers the remaining section known as the Upland Parcel. The InterTribal Sinkyone Wilderness Council, a coalition of 10 Indian tribes, will be offered a two-year option to purchase the tract for \$1.4 million.

An easement will guide the property's use in a way that provides income while requiring preservation of the ecosystem, according to Laurie Wayburn, executive director of the Pacific Forest Trust, which holds the trust. The easement allows the InterTribal Council to use about 5 percent of the park for a native plant nursery, back-packing and horse camps, trails for access into the state park, and educational and cultural camps. Limited logging of mature, but not old-growth, trees will also be allowed.

The site will become the nation's first intertribal wilderness park, said Hawk Rosales, executive director of the Intertribal Sinkyone Wilderness Council. The Council is a coalition of area tribes whose members have historical ties to the now-extinct Sinkyone Tribe.

The tribes will continue to practice riparian restoration to reduce erosion and encourage the return of native fish and other endangered species.

[For more information, contact Laurie Wayburn, Executive Director, The Pacific Forest Trust, Boonville, CA 954415. Phone: (707) 895-2090, or Hawk Rosales, Executive Director, InterTribal Sinkyone Wilderness Council, 190 Ford Road, # 333, Ukiah, CA 95482. Phone: (707) 463-6745.]

Barton Springs Water Protection Efforts Challenged

Contributed by D. Lauren Ross, Ph.D., P.E., Glenrose Engineering, Austin, Texas.

In 1992, citizens of Austin, Texas, voted overwhelmingly to enact the Save Our Springs (SOS) ordinance, mandating urban development regulations for nonpoint source pollution control to protect Barton Springs and Edwards Aquifer. Despite serious setbacks since that triumph, the SOS water advocacy group carries on in the spirit of Margaret Mead's counsel, "Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has."

Save Our Springs Ordinance Weathers Scrutiny

To date, the SOS ordinance has faced four formidable challenges to its implementation. First, the effectiveness and validity of the SOS ordinance was scrutinized by the Texas Water

Commission, the state agency responsible for reviewing municipal water pollution abatement programs. Eventually, in anticipation of a Texas Water Commission ruling that the SOS ordinance was technically valid, the developers withdrew their challenge against the ordinance to avoid damaging their opportunity for future legal claims.

A second potential obstacle arose when it became evident that the city of Austin would write rules governing the day-to-day implementation of the ordinance's pollution prevention standards, as opposed to drafters of the ordinance. There were, for example, differences between the drafters and city staff involving the calculation of the post-development stormwater runoff coefficient used to determine capture volume for BMP ponds. However, both parties eventually agreed on most of the substantial ordinance implementation issues.

Although the SOS ordinance successfully weathered the first two challenges, it will probably be rendered ineffective by judiciary and legislative processes.

Judicial and Legislative Forces Prove to be Formidable Foes

A third challenge concerns the legal validity of the ordinance. A landmark trial affecting the SOS ordinance occurred last fall when a rural jury, from a county outside Austin, ruled that the SOS ordinance was invalid on 18 points of law. (One juror with professional water quality experience supported the ordinance.) The most visible plaintiffs in the Hays County trial were small landowners with a vested financial interest in the proposed development project affected by the SOS ordinance. Even though the SOS ordinance allowed for a higher impervious cover than the previous ordinance, these landowners opposed SOS due to its "no variances allowed" provision. Their law fees were financed by one of Austin's largest developers, Freeport-McMoran, whose proposed development in 1991 galvanized the Austin community to protect Barton Springs.

In addition, Freeport-McMoran sued Austin directly for violation of the corporation's civil rights through implementation of development regulations. Although Freeport-McMoran won the suit, the court awarded the corporation only \$113,000, far less than the millions it sought. Despite the seriousness of these court decisions, they are under appeal and may be reversed.

The fourth and potentially most damaging challenge is also the most recent one: four bills passed in the spring 1995 Texas state legislative session that critically curtail Austin's ability to protect its drinking water supply. Similar bills had been introduced in 1993, but they were either defeated in that session or vetoed by Governor Ann Richards. The effects of the 1995 bills are as follows:

- Activities that currently hold a permit can continue indefinitely under regulations in place at the time the original permit application was submitted. This legislation would appear to prevent public entities from applying updated regulations to address land development and public health issues.
- Development of properties greater than 1,000 acres (or 500 acres with approval of the Texas Natural Resource Conservation Commission [TNRCC]) would be exempt from all municipal water quality or land use regulation and subject only to regulation by the TNRCC, which currently has no generally applicable water quality regulations for development. Although state bills applying to local areas are prohibited by the Texas constitution, this bill was created by defining conditions that could potentially apply to other areas, but are specific only to Austin at this time.
- A special district was created for one large development, known as Circle C, located above the Edwards Aquifer recharge zone. The district has unprecedented powers, including subdivision and zoning authority, and limited responsibilities for water quality protection. Furthermore, the district has no responsibility, financial or otherwise, to meet the terms of contracts between Circle C and the city of Austin that have been in place for over 10 years; for example, the provision that Circle C must comply with any water quality regulation enacted by the city.
- A state "takings" bill was passed. The effect of this law prohibits the city of Austin from considering the geological differences that impact the aquifer outside the city limits but within its jurisdiction on water quality matters. This bill also authorizes private land owners to sue governmental entities to invalidate regulations or require compensation for actions that decrease property values.

Clean Water Initiative Expands without SOS

Despite these setbacks, the Austin community maintains its commitment to protecting the quality of its watersheds and Barton Springs. Advocates of the SOS ordinance continue to oppose expensive capital improvement projects that extend urban infrastructure and roads, thereby encouraging urban sprawl into watersheds that contribute to the water supply.

In a message directly targeting consumer awareness, environmentally sensitive areas of the community have been mapped. In addition, an ordinance has been passed to extend some of the development regulations for the Barton Springs Zone to all of Austin's suburban watersheds. These regulations include a requirement to capture and treat additional rainfall runoff from high impervious cover areas. So although the fate of the ordinance appears cast, the citizens of Austin continue to advocate the protection of Barton Springs.

[For more information, contact D. Lauren Ross, Ph.D., P.E., Glenrose Engineering, 1711 South Congress Avenue, Suite 201, Austin, TX 78704. Phone: (512) 448-2033.]

In Virginia, 319 Grant Funds Constructed Wetlands to Treat Effluent from Privy

Adapted with permission from *The Virginia Environmental Health Bulletin*, Vol. 7, No. 1, Fall 1994.

In Fauquier County, Virginia, as elsewhere, septic failure poses a serious nonpoint source pollution concern. Effluent from failing septic tanks is a potential source of nutrient loading and elevated bacteria levels in nearby waterways. Often the quality of the soils where a home and septic system have been constructed are not suitable to support a conventional effluent treatment system. Now a unique approach to tackling this dilemma is being tried in Fauquier County. The project involves placing constructed wetlands on a historic site.

The project site is a turn-of-the-century schoolhouse just outside of the village of Marshall. The schoolhouse, which is under consideration for listing on the national and state historic registers, has been unused since the 1960s. Under the guidance of architect Jack LaMonica, the county-owned schoolhouse is being restored to its original condition and will be turned into a museum.

The schoolhouse's old privy has been replaced with a modern facility as part of the project. But the historic site has substandard soil properties and a fluctuating seasonal water table that pose potential problems for conventional septic drainfields.

So Charles Shepherd, John Largent, and Chuck Jackson of the Fauquier County Health Department; Danny Hatch, Fauquier County soil scientist; and members of Keep Fauquier Clean have obtained a 319 grant to treat effluent from the privy with a system of constructed wetlands and drip irrigation.

An Alternative System Takes Shape

Effluent from the improved privy enters a baffled 1,125 gallon septic tank for initial treatment. From here, effluent flows through one of two 8-by-24-foot wetland cells. The first wetland cell, 14 inches deep, has a bottom layer of 3- to 4-inch-diameter rock sitting atop a plastic liner. Pea gravel and mulch placed above the larger rock provide a base for the growth of the root mat of native Fauquier County plants. Railroad ties donated by Norfolk and Western Railroad create a 25-inch tall border around the cell. The second wetland cell is identical to the first, except that it is unlined and extends only nine inches deep to facilitate percolation into the soil. Cooperative Extension Master Gardeners chose and planted a combination of native cattails and irises.

Physical, biological, and chemical processes combine in each wetland cell to treat effluent. The even distribution of flow across the wetland cells allows root uptake and transpiration of water to the atmosphere. The water level in the wetland cells is kept to one inch below the gravel surface, to improve treatment by the plant root mat and to control mosquitoes. Fresh water can be added to the cells as needed. Percolation of wastewater into the soil in the second cell provides filtering and allows water to be purified by chemical reactions in the soil. Valves installed between the privy septic tank and the wetland cells and between the two wetland cells divert water to the pump system in case of malfunction.

After leaving the second wetland cell, water and any remaining effluent enter a 1,125-gallon pump chamber that connects to the drip irrigation system. Installed by the American Manufacturing Company of Manassas, Virginia, the irrigation system is a network of tubing 14 to 16 inches below the surface. The irrigation system further treats and disposes of the wastewater in the most suitable section of the soil. Keeping the effluent on-site also eliminates the need for a discharge permit.

Winter weather delayed the installation of the drip irrigation system until this spring. "Because this wetland is the first of its type to be constructed in Virginia," Hatch said, "every work day is a learning experience. Within the next several weeks, we hope to have the remaining facilities in place and to start monitoring the constructed wetlands and drip irrigation system." Monitoring wells were installed around the site at different depths in order to survey the fluctuating seasonal water table and establish a baseline for the data. Water quality data will be collected over three years.

A hard working group of volunteers from the public and private sector, under the lead of Paddy Katzen, deputy secretary with the state Department of Environmental Quality, donated time and materials to make the project a reality. They are hoping their effort will yield an inexpensive and effective method to treat effluent. "In time," Hatch commented, "hard data will reveal how efficient this system is in cleaning up this pollutant and benefiting the environment." Once proven, the system can be used by water quality managers to prevent nonpoint source pollution and to improve the situation of homeowners faced with failing septic systems.

[For more information, contact Danny Hatch, Fauquier County Department of Community Development, 40 Culpeper Street, Warrenton, VA 22186. Phone: (540) 347-8660; or C.A. Jackson, Jr., Fauquier County Department of Environmental Health, 320 Hospital Hill Drive, Suite 21, Warrenton, VA 22186. Phone: (540) 347-6369.]

Shellfish Protection Districts Combat NPS, Preserve Industry in Washington

Commercial shellfish production in Washington State is an \$84-million-a-year industry, with Puget Sound harvests contributing about half of the revenue. Increasingly threatened by nonpoint source pollution, however, shellfishing in 40,730 acres of Washington's commercial shellfish beds has been restricted or prohibited since 1981 by the Washington Department of Health. In 1987, the Puget Sound Water Quality Management Plan developed a goal to prevent further restrictions on shellfish beds and to upgrade at least one shellfish harvest area a year. Shellfish Protection Districts authorized by 1992 legislature are a step toward reaching that goal (see *Nonpoint Source News-Notes* #6). Created by counties with shellfish tidelands, the Districts provide a funding mechanism for shellfish and water quality protection programs.

The Lower Hood Canal Shellfish Protection District, one of five now established, is a good example of how the Districts operate.

Lower Hood Canal Creates a Shellfish Protection District

Mason County established the Lower Hood Canal Shellfish Protection District in May 1993. Although counties can create the districts voluntarily, the Lower Hood district was formed in response to a state law requiring the creation of a Shellfish Protection District when a shellfish growing area is downgraded or closed because of nonpoint source pollution. Failing on-site septic systems and agricultural runoff in Mason County's Lynch Cove triggered the downgrade and the formation of the Lower Hood Canal District.

The Lower Hood Canal District includes 5,411 parcels with on-site septic systems, including 1,350 located along the waterfront. Landowners pay \$52 a year per parcel of land, and an additional \$26 a year charge for parcels with tidelands.

Copies of the 1994 *Puget Sound Water Quality Management Plan* are available from the Puget Sound Water Quality Authority, P.O. Box 40900, Olympia, WA 98504-0900. Phone: (360) 407-7300; Fax: (360) 407-7333. An NPS action plan addresses watershed issues, on-site sewage disposal, agricultural and forest practices, pest management, marinas, recreational boating, and household hazardous waste.

Facilities permitted for wastewater discharge under the National Pollutant Discharge Elimination System (NPDES) are exempt from district fees to avoid charging operations duplicate fees. Forest and timber lands are exempt because they are not major sources of fecal coliform bacteria.

Counties with Shellfish Protection Districts receive priority consideration for state water quality funding, and districts may use their revenue as matching funds to obtain additional grants. A \$20,000 Ecology Shellfish Initiative Grant, a \$63,500 Puget Sound Action Grant, and the county general fund provided other sources of financial support for the Lower Hood Canal Shellfish Protection District in 1994. The money was used for water quality protection activities such as

- inspection, repair, and education pertaining to on-site sewage systems;
- installation of agricultural BMPs through conservation district farm planning; and
- production of a newsletter and other educational materials on water quality.

To prevent duplication of effort, agencies such as local health departments, public works departments, and conservation districts can use revenue raised by districts to carry out related water quality programs.

The Mason County Health Department helps identify failing on-site septic systems and oversees their repair. Since 1994, 1,517 inspections have uncovered 162 failing systems in the watershed, of which 53 systems have been repaired. Progress is slow because the small lot sizes in the watershed often require difficult and expensive engineering solutions to septic system failure. A low-interest loan program in Mason County assists homeowners with repair costs.

The formation of mandatory Shellfish Protection Districts in response to shellfish bed downgrades and restrictions ensures an active response by local agencies and residents to nonpoint source water quality problems. The districts offer a unique approach to water quality protection, recognizing the link between improving and protecting water quality and maintaining the resource base of the shellfish industry. Duane Fagregren, deputy director of the Puget Sound Water Quality Authority, sums up the role of Shellfish Protection Districts. "The districts provide the local funding necessary to help protect clean water critical to the economy of many rural areas in Washington." Fagregren, a former president of the Pacific Coast Oyster Growers Association continued, "It's a quality of life issue for most of us who live and play on the waters and shores of Puget Sound."

[For more information, contact Kevin Anderson of the Puget Sound Water Quality Authority, P.O. Box 40900, Olympia, WA 98504-0900. Phone: (360) 407-7324.]

Technical Notes

Pesticide Studies in Conference Proceedings — Poster Presentations Give Researchers a Chance to Share Results

EDITOR'S NOTE: The following abstracts were included among the pesticide poster presentations made at the "Clean Water, Clean Environment, 21st Century, Team Agriculture Working to Protect Water Resources" conference, March 5-8, 1995. The conference, sponsored by the USDA's Working Group on Water Quality, was coordinated by the American Society of Agricultural Engineers, who also published the proceedings. From time to time *News-Notes* will present abstracts of various technical studies deemed to be generally useful and interesting to nonpoint source water resource managers and other readers.

Where's the Atrazine? — A Regional Groundwater Synopsis by N. Fausey et al.

More than 80 percent of the atrazine used in the United States is applied to control broadleaf weeds in cornfields in the Midwest. A major concern is whether this atrazine is a potential contaminant of groundwater. The Management Systems Evaluation Area (MSEA) Program is conducting studies in eight of the 11 Corn Belt states to determine the extent of atrazine leaching under field conditions.

Atrazine occurrence in groundwater is governed by landscape topography, depth to the water table, hydrogeology of the area, and soil qualities, including its sorptive affinity and hydraulic conductivity. The time of application in relation to infiltration of rainfall or irrigation can also be very important.

With few exceptions, the concentration of atrazine in the groundwater is well below the 3 parts per billion maximum contaminant level (MCL). The highest concentrations of atrazine have been in groundwater at three sites where irrigation is part of the farming management. However, new irrigation schemes are actually lowering the concentration of atrazine in the groundwater at one of these sites at which groundwater is used to supply the irrigation water. Soil samples indicate that most of the atrazine remains near the soil surface, that the concentration in the soil is not increasing over time as more atrazine is applied, and that soil organisms are able to decompose most of the atrazine within a few months after application.

This study has the following implications for farming practices including rotations, tillage, irrigation, and pesticide application methods. Irrigation and ridge tillage both promote high infiltration; any excess water moves below the root zone and enhances groundwater recharge. Irrigation can be managed to minimize recharge soon after atrazine application. Corn-soybean rotation requires less atrazine than continuous corn, and banding atrazine over the row also reduces the amount applied. Thus, proper management of water along with rotation and banded application can reduce this threat to groundwater quality.

[Pages 69-72 in Clean Water, Clean Environment, 21st Century, Team Agriculture Working to Protect Water Resources. Volume 1, Pesticides. Proceedings of a Conference sponsored by the USDA's Working Group on Water Quality. Coordinated and published by the American Society of Agricultural Engineers, St. Joseph, MI. For further information on the poster, call N. Fausey at USDA-ARS, 590 Woody Hayes Drive, Columbus, OH 43210. Phone: (614) 292-9806.]

Reducing Herbicide Inputs in Weed Management Systems for the Corn Belt

by J.W. Hummel, L.M. Wax, and E.W. Stoller.

Our research is designed to develop technologies that reduce herbicide inputs, maximize pesticide and fertilizer applications to reduce off target movement, and develop alternate weed management systems using environmentally friendly herbicides. Excellent corn and soybean yields were obtained in field tests of weed management systems using less than 1 ounce of postemergence herbicides per acre in conventional and no-till production systems. This low rate, low-cost technology is ready for wide-scale testing in grower field evaluation. It may improve water quality and reduce use of atrazine and alachlor.

A multiple-wavelength, landscape-independent soil cation exchange capacity (CEC) and organic matter sensor that can be used over a wide geographic range has been developed and licensed for commercialization. Sensors for other soil parameters are being sought, and we have made progress on nutrient sensing using ion-selective field effect transistors and on-machine vision for swath guidance.

A model has been developed to predict time of emergence for several important weeds. It is driven by soil temperature and moisture conditions that allow growers to maximize weed control with timely herbicide applications. We are investigating the spatial patterns of soil fertility and developing methods for identifying scenarios in which making site-specific herbicide applications has economic as well as environmentally positive returns.

[Pages 93-96 in Clean Water, Clean Environment, 21st Century, Team Agriculture Working to Protect Water Resources. Volume 1, Pesticides. For further information, call J.W. Hummel, Agricultural Engineer, Crop Protection Research Unit, USDA Agricultural Research Service, 1304 W. Pennsylvania Avenue, Urbana IL 61801. Phone: (217) 333-0808.]

Pesticides in Chesapeake Bay — Atmosphere and Surface Waters

by L.L. McConnell et al.

Drainage water from 3,000 square miles of agricultural lands flows into the Chesapeake Bay, and an estimated 4.8 million pounds of pesticides are used within this drainage area each year. Scientists have shown that pesticides can also be released to the air from soil and plant material during and after application through a process called volatilization. Significant amounts of pesticides may also be lost to the atmosphere during and after application. Subsequent redeposition from the atmosphere of pesticides to surface waters is an area of concern as some pesticides are toxic to wildlife at extremely low levels.

The potentially important role of the atmosphere as a nonpoint source of pesticides to the Chesapeake Bay was demonstrated in an earlier USDA study, which found that regional atmospheric transport and baywide deposition may be an important mechanism for the introduction of pesticides such as atrazine, simazine, and toxaphene into the Chesapeake Bay. This project is a continuation of the earlier work and attempts to determine changes in atmospheric loadings over an entire planting season and in different regions of the Bay.

Concentrations of some of the heaviest use herbicides, insecticides, and fungicides, as well as some past-use organochlorine pesticides, were measured in air and surface water from 16 stations in the Bay during four 4-day cruises (March, April, June, and September 1993). Air samples were also collected from three land-based stations during each cruise. Of the target pesticides, the compounds most often observed in the atmosphere, in order of greatest concentration to lowest, were chlorpyrifos, metolachlor, trifluralin, hexachlorocyclohexanes, endosulfan, and chlordane. Levels of all compounds were relatively low (0.01 to 1.0 parts per trillion).

In surface waters, the highest concentrations were found in the north near the mouth of the Susquehanna River and concentrations decreased as we moved southward toward the Bay. The Susquehanna brings in almost half of all freshwater entering the Bay each year, and its watershed is heavily agricultural. Pesticides may be entering this river through runoff or atmospheric deposition. Tidal inflows from the mouth of the Bay may be responsible for the decline in concentrations from north to south. The most often observed compounds, in order of highest to lowest levels in water, were chlorpyrifos, atrazine, metolachlor, simazine, diazinon, and hexachlorocyclohexanes. Concentrations in water were also relatively low (approximately 0.1 to 10 parts per billion for each compound). While pesticides were observed in the surface water during each cruise, levels observed during the September cruise were significantly lower than the other three cruises. The highest levels over all the stations were observed during the June cruise (following the spring planting). These data allow us to set priorities for future projects and to make preliminary estimates of pesticide loadings to Chesapeake Bay.

[Pages 129-132 in Clean Water, Clean Environment, 21st Century, Team Agriculture Working to Protect Water Resources. Volume 1, Pesticides. For further information, call L.L. McConnell, USDA Agricultural Research Service, Environmental Chemistry Laboratory, Building 007, Room 225 BARC-West, Beltsville, MD 20705. Phone: (301) 504-6298.]

To order the proceedings, contact the American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, MI 49085-9659. Ask for ASAE 2-95. The three-volume set is \$45; \$41 for ASAE members.

STORET X Prototype Gets Thumbs Up from Users on National Tour

EPA's Office of Water demonstrated the latest prototype of modernized STORET at six locations across the country, including Tallahassee, Athens, Chicago, Seattle, Sacramento, and San Francisco. The new version, "Maintain Site/Organization/Project" represents two-thirds of the prototype and will be used for data entry of the location, owner, and purpose of the sampling site. STORET X will replace the current STORET, BIOS, and ODES ambient water quality and biological monitoring data systems by mid-1997 and provide a national system to manage environmental water and biological data throughout the country.

Participants at the demonstration sites universally accepted the fundamental concepts and structure of the prototype and offered comments that would "fine tune" it. Many were impressed with its ability to house high-level metadata and said that the STORET X prototype mirrors the actual business of water quality monitoring in EPA and the states.

Many organizations interested in STORET modernization are in the process of reengineering their own systems. Some states are redesigning their systems to be compatible with STORET X.

The Florida Marine Research Institute and EPA will test the revised version of the prototype in October 1995. The complete system prototype will be ready for testing by the end of 1995, and will be able to collect and maintain sample and test results data. The full system prototype will be demonstrated at the next workshop, scheduled for April 1996.

[For more information, contact Phil Lindenstruth, Office of Water (4503 F), U.S. EPA, 401 M St., SW, Washington, DC 20460. Phone: (202) 260-6549. E-mail: lindenstruth.phil@epamail.epa.gov.]

Notes on Environmental Education (and having fun at the same time)

College-Level Pollution Prevention Educational Tool

The National Pollution Prevention Center for Higher Education (NPPC), located at the University of Michigan, is developing educational compendia integrating pollution prevention education into course work in several disciplines.

Currently, compendia are available in accounting, business law, chemical engineering, environmental studies, industrial ecology, industrial engineering, and operations research. An agricultural compendium that will contain nonpoint source information is in production.

Each compendium includes introductory materials, annotated bibliographies, case studies, problem sets, and collections of syllabi to demonstrate the environmental and economic efficiencies of pollution prevention.

NPPC has also developed a student training program focused on pollution prevention. It provides graduate and undergraduate interns with valuable practical experience, while the business sponsoring the intern gains quality work in pollution prevention.

The Center represents a collaborative effort between EPA, business, industry, nonprofit organizations, and academia. Some modules are available electronically (<ftp://snre.umich.edu> and <http://www.snre.umich.edu>) and through EPA's Pollution Prevention Information Clearinghouse (202-260-1023).

[For more information, contact NPPC, 430 East University, Ann Arbor, MI 48109-1115. Phone: (313) 764-1412; Fax (313) 936-2637. E-mail: nppc@umich.edu.]

No Laughing Matter: Comic Books on NPS

Who said comic books were always funny? Entertaining, yes! Educational? Sometimes. Comic books from the Soil and Water Conservation Society combine the best of both worlds.

This series of learning tools done in comic-book format looks like ordinary comic books, but they feature kids investigating and solving conservation problems. And even when the stories involve genies, robots, and aliens, the method is solid.

Story lines address reducing nonpoint source pollution by managing agriculture, mining, and energy. The latest in the series, "Across Time and Space," focuses on ecosystems and the interactivity of systems.

One of the books is also available in Spanish. But that's not all. With each book comes a teacher's guide and several suggested activities to extend the learning. The packet even includes a quiz to evaluate each lesson.

[For more information, contact Tim Kautza, Soil and Water Conservation Society, 7515 N.E. Ankeny Road, Ankeny, Iowa 50021. Phone: (515) 289-2331.]

Getting Down and Dirty — Envirothon Teams Win on Soils Knowledge

The Lorax Team of Middletown High School, Middletown, Maryland — one of only two all-girl teams in the Maryland State Envirothon — walked away with top honors from the 1995 state competition at the Cunningham Falls State Park, near Thurmont, Maryland.

"We were shocked," the girls said. "The third place winner was announced — and it wasn't us — and the second place winner was announced — and it wasn't us. We really gave up hope then, because the second place winner had won first in every category but soils.

"Then the first place winner was announced, and it was us! We couldn't believe it."

The girls, who named their team for a Dr. Seuss character, confessed that they "hadn't had a clue about soils" in the earlier county competition. They boosted their knowledge level, however, at an all-day training session before the state competition. When the Lorax team didn't understand the trainers, they asked questions. When other teams attending the training session left for the day, the Lorax Team stayed behind to learn more. "It really paid off," the girls admitted. "Our soils score was 15 points higher than the soils score of the second place winner!"

During the state competition, the team ripped apart the written portion of the exam and gave different pages to each team member to fill in or pass along to someone else. Questions were multiple choice, true or false, and essay. Although two members wrote most of the essay questions, everyone helped them remember what they had learned. The essay questions were very specific, for example, "draw and label an aquatic food web showing at least five trophic levels."

Lorax Team members are Elaine Bucheimer, Natalie Bucheimer, Crissi Gamache, Jen Morat, and Erin Weber, with alternates Lara Wise and Tara Harrell. All the girls are rising seniors except Lara, who is a rising sophomore. Biology teacher Ron Albaugh is their school coach and Barry Burch provides coaching from the Catoctin and Frederick Soil and Water Conservation District.

Nandua Nature Nurturers

The Nandua Nature Nurturers of Nandua High School (Olney, Virginia) were first-place winners in the 1995 Virginia State Envirothon held at the Douthat State Park in Bath and Allegheny Counties, Virginia.

Tim McMath, top soils competitor in the Virginia competition, said he got stuck studying "dirt" for three years because no one else wanted to. No fan of soil science ("It's the most boring topic I've ever read about."), McMath has one more year of high school and hasn't decided yet what he will study at college. "It might be something environmental," he said, but "it won't be dirt."

Nandua High fields two Envirothon teams each year, and Tim has been their soils expert for three years. He credits the Eastern Shore Soil and Water Conservation District for much of the team's success at the state competition. He says the District taught them a lot, and even put them through a practice test about a month before the competition. This is the district's third win; the second for Nandua High school and Tim McMath.

Members of the Nandua team are Jason Montgomery, Kate VanDyck, Sarah Kaylor, Jennings Custis, Tim McMath, and alternate Joseph Mora. They are coached by teacher Patricia Defosse with assistance from the Eastern Shore Soil and Water Conservation District.

Kate VanDyck, the team's aquatics specialist, said she answered questions about mollusks, scuds, shrimp, insects, and plants, and also had to answer questions about the specific condition of the creek at the competition site. Before the competition, Envirothon officials sent participants study material to help them focus on the site's location.

Kate, who graduated this year and plans to major in astrophysics at the University of Virginia, said, "Some people think the Envirothon is easy, but it's hard and very competitive. I learned a lot — it's something I'll remember the rest of my life."

In August, both teams will travel to Rexburg, Idaho, for the national competition. They have a lot to learn between now and then — hopefully they'll be breaking new ground on western soils.

[For more information, contact Barry Burch, Catoctin and Frederick Soil and Water Conservation District, 92 Thomas Johnson Drive, Suite 230, Frederick, MD 21702. Phone: (301) 695-2803; or Dawn Shank, Virginia Association of Soil and Water Conservation Districts, 203 Governor Street, Suite 206, Richmond, VA 23219. Phone: (804) 371-2356.]

NACD SPONSORS ENVIROTHON

Envirothon, a national environmental competition for high school teams, is sponsored by the National Association of Conservation Districts and supported by many agencies and environmental groups.

- County Conservation Districts hold the county contests, sponsor groups from local high schools, and provide training for student teams and their teachers. Winners at the county level go to the state competition. This year 30 state winners will compete for the national championship in Rexburg, Idaho, in August.
- Envirothon competition is divided into four areas: soils, aquatics, wildlife, and forestry. One student specializes in each area.
- The contest takes place in an outdoor setting, and students must answer questions specific to the site. Each team must also make an oral presentation about an environmental issue.

[For more information, contact the National Association of Conservation Districts, 408 East Main Street, P.O. Box 855, League City, TX 77574-0855]

Shedd Aquarium Opens NPS Exhibits

by Scott C. Ristau, Environmental Protection Specialist, Planning Section, Division of Water Pollution Control, Illinois Environmental Protection Agency

With funding authorized under Section 319 of the Clean Water Act and in cooperation with U.S. EPA, the Illinois Environmental Protection Agency (IEPA) has been working with the John G. Shedd Aquarium to develop and display two exhibits that focus on nonpoint source pollution.

The Shedd Aquarium, located in downtown Chicago, Illinois, overlooks Lake Michigan and is home to over 8,000 aquatic animals representing more than 650 species. Approximately 1.85 million people visit the Shedd Aquarium each year, making it a major tourist attraction and an outstanding opportunity to maximize the dissemination of nonpoint source pollution control information. Both exhibits opened August 2, 1995.

The nonpoint source pollution and stream ecology exhibit demonstrates the value and function of streams, the impact of nonpoint source pollution on water quality, and how Illinois water resources can be protected. The exhibit consists of a divided aquarium: one half resembles a healthy stream environment and the other half, polluted conditions. Both halves are stocked with native fish species of an appropriate pollutant tolerance level. The exhibit points out the nonpoint source threats to the quality of Illinois streams and the methods by which those threats can be minimized. It will remain on permanent display at the Shedd Aquarium for at least three years.

The second exhibit, the Nonpoint Source Pollution Awareness Program, explains the various forms of nonpoint source pollution, their impacts on the environment, methods for minimizing those impacts, and the importance of water quality protection. Although the issues are serious, they are presented in an engaging manner to stimulate the public's willingness to participate in practical solutions. The exhibit is located in the Shedd Aquarium's main foyer during August 1995. Each Thursday evening in August, the exhibit is part of a special "after hours" event. IEPA employees and other volunteers staff the exhibit, thus giving the public an opportunity to question water quality experts. The exhibit will remain on display at the Shedd Aquarium for an undetermined length of time before being relocated to an alternate venue.

[For more information, contact Scott C. Ristau, Environmental Protection Specialist, Planning Section, Division of Water Pollution Control, Illinois Environmental Protection Agency, 2200 Churchill Road, Springfield, IL 62794-9276. Phone: (217) 782-3362.]

NPS Electronic Bulletin Board News

This portion of *News-Notes* is prepared for the benefit of *News-Notes* readers who are regular users of U.S. EPA's *NPS BBS*.

Nonpoint Source Electronic Bulletin Board System. EPA's *NPS BBS*, through the user's personal computer, provides timely, relevant NPS information; a nationwide forum for open discussion; and the ability to exchange computer text and program files. Specific Issue Groups (SIGs or mini-bulletin boards) are dedicated to specific topics. Currently, there are seven SIGs on the *NPS BBS*: Watershed Restoration, Agriculture, TMDLs, Waterbody System Support, NPS Research, Volunteer Monitoring, and Coastal NPS Control. All articles from all issues of *News-Notes* are stored on the *NPS BBS* and may be retrieved on your personal computer. A searchable *News-Notes* database helps you find the information you need.

To access the *NPS BBS*, you will need a PC or terminal, telecommunications software (such as Crosstalk or ProComm), a modem (1200, 2400 or 9600 baud), and a phone line. The *NPS BBS* phone number is (301) 589-0205. Parameters are N-8-1.

The *NPS BBS* may also be accessed from the Internet by typing TELNET FEDWORLD.GOV. Once on FedWorld, turn ANSII graphics off and go through the Gateway to NPS-BBS, or command D 79.

EPA's Water Programs Go On-Line

The EPA Office of Water/Office of Wetlands, Oceans, and Watersheds is beginning to use the Internet to enable the public and federal, state, and local partners to get information on America's water resources. The new Water Information Network (WIN) will promote partnerships and communication and help communities interested in the environmental challenges facing America's water resources. Information on the WIN is designed to flow from those who have it to those who need it.

Currently, access to newsletters (including *NPS News-Notes*), fact sheets, brochures, publications, and other program information about the quality of the nation's water resources is available through WIN. Access to water quality monitoring methods, tools, and automated information systems such as STORET is also provided. Information is exchanged through hotlines, bulletin boards, and group e-mail conversations. Added information, links to partners, homepages, and other services are also coming to the WIN.

WIN uses EPA's public access servers and can be accessed over the World Wide Web or Gopher. Enter the Universal Resource Locator (URL) for the EPA homepage: <http://www.epa.gov> and go to *EPA Offices and Regions*, then to *Office of Water*, or enter <http://www.epa.gov.owow> and go directly to WIN. Users need an Internet provider with an Internet Protocol (IP) address, at least a 386 or comparable personal computer, four megabytes of RAM, and tools for reviewing graphics on the World Wide Web.

[For more information on WIN, contact Karen Klima, Office of water, U.S. EPA, 401 M St., SW, Washington, DC 20460. Phone: (202) 260-7087. E-mail: klima.karen@epamail.epa.gov.]

Reviews and Announcements

Luck Isn't Enough — Water Video Wins Film Festival Award

The U.S. International Film and Video Festival, the world's largest competition honoring sponsored business, television, and industrial productions, awarded a Certificate for Creative Excellence to the film "Luck Isn't Enough: the Fight for Clean Water."

Produced by the Nonpoint Education for Municipal Officials (NEMO) Project of the University of Connecticut Cooperative Extension Service, "Luck Isn't Enough" originally focused on the waters of Long Island Sound. Released to popular and critical acclaim in 1994, the video was later revised for national distribution on a grant from the U.S. Environmental Protection Agency. (The original video was reviewed in *News-Notes* issue #36, May/June 1994.)

This year's festival, the 28th Annual International Awards Competition, received 1,500 entries from 27 countries. Fewer than 20 percent of the entries survive the competition sufficiently to take home honors. The NEMO video won the certificate in the "Environmental Issues and Concerns" category.

[To obtain a copy of the video, send \$10 (includes postage) to Chester Arnold, NEMO Project, University of Connecticut Cooperative Extension, 1066 Saybrook Road, Haddam, CT 06438. Phone: (203) 345-4511; Fax: (203) 345-3357; E-mail: carold@canr1.cag.uconn.edu]

Environmental Patriarch Calls for Restoration

by Rachel Reeder, a *News-Notes* staff writer

Let the Mountains Talk, Let the Rivers Run: A Call to Those Who Would Save the Earth. David R. Brower with Steven Chapple. New York: HarperCollins West, 1995. Hardcover, 196 pages, \$20.00.

David Brower — former executive director of the Sierra Club, founder of the League of Conservation Voters, Friends of the Earth and Earth Island Institute, and at 82, a shameless partisan for the earth, is not bad company of an evening or on a walk, and this slim volume has so much humor and challenge in it that one can almost hear the author speaking rather than see

the ink on paper — though HarperCollins West has done that nicely, too. The book is printed on kenaf, a 12-foot-tall cousin of cotton and okra that has more cellulose than wood. It would, Brower suggests in chapter 8, become considerably cheaper — and more widely recognized as an alternative to wood pulp — if New York and Los Angeles used it for making phone books.

In this book, part memoir and part sermon, the author uses metaphors drawn from mountain climbing, from western scriptures, and from conversations to stride rapidly across the major issues of our time: eco-preserves, tolerable cities, forest preservation, the appetite we have for resources, population, the need for energy strategies. The terrain is too vast to treat in depth. The chapter on population is called “More Monks,” and the statistics, though powerful, are also more sound bites than sound science.

So what is it I like about this book? I love it that he makes me want to know the whole story. Brower makes me want to find out what the stakes really were in the years “we” built the Glen Canyon Dam, and after the war, when we went back to resources consumption instead of using the substitutes that research had found. I want to know what was happening while I slept; what was behind the full page ads and the events that got him fired from the Sierra Club. And what is still happening; what’s going on in southern India, the Caribbean, and along the Kissimmee River in Florida. But most of all, I love it that he puts all of us in the same boat — the ark that would conserve, preserve, and in the end, restore, the Earth.

“Restoration,” he says, “means putting the Earth’s life support systems back in working order: rivers, forests, wetlands, deserts, soil, and endangered species, too.” And, he adds, “human systems also need restoration” — the South Bronx as well as other habitat.

I leave it to other readers to decide whether an “Earth Corps” or “CPR Corps” — the latter means a corps trained to provide emergency measures to conserve, preserve, and restore the Earth — like the agencies Brower envisions in chapter 13 is ever likely or even truly desirable. A corps, even a well-intentioned one, must be administered, budgeted, and staffed, and sooner or later, its vision and mission tied down in neat corporate objectives. But the notion that CPR should be added to everyone’s job description, that the wilderness in the world and within us is worth saving, that we shouldn’t worry about what nature is or is not spewing forth but only about our own excesses and — most important of all — that we shouldn’t take ourselves too seriously are words worth hearing, over and over again. In the end (p. 196) is the beginning:

*Let us begin. Let us restore the Earth. Let the mountains talk, and the rivers run.
Once more and forever.*

Publication Identifies Agricultural-Environmental Trends

Agricultural Resources and Environmental Indicators, published in December 1994, by the USDA’s Economic Research Service (ERS) Natural Resources and Environment Division, is the ERS’s newest “basebook.” It identifies trends in land and water use, describes commercial inputs, reports on the condition of natural resources used in the agricultural sector, and describes and assesses public policies that affect conservation and environmental quality in agriculture.

The book examines the complex connections among farming practices, conservation, and the environment. It takes stock of how natural resources (land and water) and commercial inputs (energy, nutrients, pesticides, and machinery) are used in the agricultural sector, shows how they contribute to environmental quality, and links their use and quality to technological change, production practices, and farm programs.

Topics include land use, quality, and ownership; farm real estate values; water use and quality; fertilizer, pesticides, energy, and farm machinery; technology; and the conservation reserve, compliance, wetlands, and non-USDA programs that affect agriculture.

Thus, the book contains a wealth of information on resources and land uses that will be helpful to resource managers in a variety of settings. A few illustrations drawn from a single topic — water use and quality — will serve to indicate the book’s usefulness and interest.

- Statistics relating to water use (section 2.1) indicate that the United States as a whole has adequate water supplies —and withdraws only about 7 percent of its annual renewable supplies for consumptive use. However, these resources are not

distributed evenly and in many areas, the overall statistics belie the fact that regional supplies are limited. In the Colorado River Basin, for example, 96 percent of the annual renewable supply is withdrawn before the river flows into Mexico (p. 45).

- Graphs and maps provide helpful interpretation of the complex material by region, usable definitions are provided as needed, and references are provided not only to the text itself, but in some cases in additional inserts to help people pursue an interest they would not otherwise know how to begin. For example, page 56 contains helpful hints for learning more about water use and irrigated agriculture. Irrigation agriculture is, by the way, the largest use category, although irrigation withdrawals have declined from 46 percent in 1960 to 40 percent in 1990. Other uses include supplies for thermoelectric use, public and rural needs, and other industries.
- The majority of the nation's assessed waters meet designated water quality standards but the report notes that agriculture is identified as a major or minor contributor to 72 percent of the river miles and 56 percent of the lake acres assessed in 305(b) reports (p. 60). Runoff from cropland contributes much of the sediments and nutrients in freshwater systems, while confined animal facilities can be a source of pathogens and nitrogen.
- The vulnerability of groundwater to agricultural nonpoint source pollution is acknowledged, but this problem is less well documented than the problem for surface waters. (Vulnerability does not correlate to actual cases of pollution). Other agricultural impairments that yield regional but not national problems are salinization and wetlands degradation.
- The cost of agriculture-related water quality problems is difficult to measure; however, a "best guess" puts the cost of cropland erosion at \$3 billion per year — from damage to freshwater use, storage, navigation, commercial fishing and municipal treatment plants; the cost of groundwater contamination is between \$890 million and \$2.2 billion (p. 63).
- USDA and non-USDA programs related to solving water quality problems are discussed in chapter six of this report.

A final note: aware of both the avid interest that most of us have in statistics and our almost universal tendency to misuse them or to quote them out of context, the preface of this report briefly notes the methods used in arriving at environmental indicators, and their scope and intended uses.

[For more information, contact Richard Magleby, Economic Research Service, 1301 New York Avenue, NW, Room 532 Washington, DC 2005-4788. Phone: (202) 219-0436. To order, call (800) 999-6779. Ask for Agricultural Resources and Environmental Indicators, publication number AH-705.]

North Carolina Groups Examine the Benefits and Costs of Nonregulatory Land Protection

In 1991, North Carolina residents spent \$1.2 billion on hunting, fishing, and outdoor recreation. That same year, visitors to the state's 20 coastal counties spent over \$995 million, much of which is attributable to the coast's natural and scenic value.

These findings and others that measure the benefits and costs of protecting North Carolina's natural lands are documented in an economic study prepared by Research Analytics, Inc., a Raleigh consulting firm.

This report identifies land as a unique natural resource because it simultaneously provides goods and services to its owners and to the public. Beyond its direct value, every tract of land affects the value of neighboring tracts, the local economy, the ecosystems in and around it, and the quality of life in the community.

Building a Sustainable Landscape: the Benefits and Costs of Non-Regulatory Land Protection, published by the North Carolina Coastal Federation and the North Carolina Land Trust, discusses the several benefits and costs of land conservation most relevant to North Carolina:

1. **The effects on the value of the tract directly involved in a land use decision** — Development tends to increase the market value of land by increasing its access to roads and utilities, thus allowing the owners to make a profit. Regulations generally increase the value of existing residential land by protecting amenities, such as the lack of congestion and nearby natural areas and open space. At the same time they tend to decrease the value of undeveloped land.
2. **The effects on neighboring property values and on the general price of land** — Conservation land acquisitions and easements generally increase the value of adjacent properties, especially where those properties are existing or potential residential areas. For example, homes adjacent to Pea Island National Wildlife Refuge in Dare County are estimated to be worth about 20 percent more than similar nearby homes that are not adjacent to the refuge.
3. **Effects on farming, forestry, and tourism** — Conservation easements and the purchase of natural areas in North Carolina are likely to have little effect on total agricultural and forestry production because the number of acres is unlikely to be large enough to affect these industries.

Protecting natural areas that are suitable for active or passive outdoor recreation can boost tourism, the report points out. Tourism is likely to be the state's biggest industry by 2000, and evidence suggests that quality natural areas attract visitors. Tourists spent more than \$7 billion in the state in 1991, with almost \$1 billion spent in 20 coastal counties.
4. **Effects on the quality and quantity of things that cannot be bought and sold** — The report points out that many of the goods and services provided by nature are essentially free, in the sense that we never paid for them in the past. When ecological or aesthetic resources are degraded, we lose some of the value of these free goods and services.

The report also provides some general observations regarding the trade-offs involved with natural area protection:

- In general, measures to protect land do limit the land's potential contributions to the economy. However, the loss is often offset by such benefits as enhancement of nearby property values, business opportunities arising from the protected area, and general quality of life.
- In the long run, the property value and fiscal impacts of conservation are generally positive. In some cases, areas can avoid expensive environmental protection measures.
- Protected areas with public access and such facilities as trails and interpretive centers can increase tourism and local property values.
- In most cases, the permanent protection of open space and unique natural areas will redirect development, but not reduce the overall level of development.

[For a copy of *Building a Sustainable Landscape: the Benefits and Costs of Non-Regulatory Land Protection* (\$5), contact the North Carolina Coastal Federation, 3609 Highway 24, Newport, NC 28570, or call (919) 393-8185.]

Innovative Options for Financing Chesapeake Bay Cleanup

A panel appointed by Maryland Governor William Schaefer and charged with finding new ways to finance the cleanup of Maryland's Chesapeake Bay tributaries has compiled a list of over 35 different money-raising options that can be used by citizens and state and local governments.

In August 1992, Maryland, Virginia, Pennsylvania, and the District of Columbia pledged to develop a cleanup strategy to reach a 40 percent pollution reduction target for each of the Bay's major tributaries. The tributary strategies will improve the Bay's water quality, habitat, and living resources.

Eileen Rehrmann, chair of the panel, said, "We all knew [carrying out the strategies] was going to cost money. The panel's task was to come up with new, innovative ways for federal, state, and local governments and the private sector to raise the money they need to pay for the cleanup." The issues of fairness and equity, including who pays and how much, were central to the panel's effort to develop the financing alternatives. The idea that those who benefit and those who pollute should shoulder their fair shares was a theme in many of the panel's recommendations.

Published by the Environmental Finance Center at the University of Maryland (see "EPA and University Run Financial Management Center" in this issue), the report focuses on new financing approaches in the four major areas targeted by Maryland's tributary strategies — point source pollution, urban runoff, agricultural water pollution, and resource protection. The options range from broadening the scope of the state's Revolving Loan Fund to small community "bond banks," which can save municipalities money on their bond offerings by lowering their interest rates.

Other options the panel developed include

- assessing an annual fee for the depletion/degradation of an aquifer,
- establishing local agricultural cooperatives to assist farmers in financing their pollution prevention practices, and
- issuing state mini-"Bay-bonds" for tree planting, stream restoration, and other natural resource protection projects.

[To obtain a copy of the free, 119-page report, contact Carrie Martin, Environmental Finance Center, University of Maryland, Skinner Hall, Room 0112, College Park, MD 20742. Phone: (301) 405-6384; Fax: (301) 314-9581; E-mail martin@mbimail.umd.edu]

Rhode Island Targets NPS Pollution from Marinas

by Sam Pett, Staff Scientist, Tetra Tech, Inc.

Rhode Island Sea Grant has produced the *Environmental Guide For Marinas: Controlling Nonpoint Source and Storm Water Pollution in Rhode Island* to assist marina managers in tackling the complexities of nonpoint source pollution control. A discussion of the pollutants most likely to be generated by marinas and an explanation of their environmental effects provides an effective introduction to the problem.

The guide features a review of four categories of best management practices (BMPs), for marinas in Rhode Island: solid waste and stormwater; fueling, oil, and other petroleum hydrocarbons; hazardous materials and liquid waste; and vessel discharge of sewage. Under each category, BMPs are suggested. Solid waste and stormwater BMPs are discussed in terms of pollution containment, collection and recycling, source control and delivery reduction, and education. The fueling section emphasizes spill prevention and control, and the vessel sewage section contains a discussion of the types of sewage collection systems available.

A separate section of the document focuses on developing a marina operations and maintenance (O&M) plan. Worksheets assist marina operators in the selection of the BMPs most appropriate for their location and situation. An example of an O&M plan for a fictitious Rhode Island marina contains completed worksheets and an explanation of the responses to help marina operators make full use of the guide.

The guide provides several useful appendices, including a model oil spill response plan, a summary of Rhode Island's stormwater permitting program, a list of pumpout manufacturers, and sample fact sheets that can be adapted by individual marinas for public education programs. The bibliography will be useful to those who want to learn more about marinas and their potential impacts on water quality.

Thanks to funding from the Rhode Island Trade Association, copies of the guide are available free of charge to Rhode Island marinas.

[To obtain a copy of the guide, send \$10 to Rhode Island Sea Grant, Communications Office, University of Rhode Island, Narragansett Bay Campus, Narragansett, RI 02882-1197. Phone: (401) 792-6842.]

Study Guide Available on the Impacts of NPS on Aquatic Communities

The Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation (DCR-DSWC) has published the *Aquatic Resources and Nonpoint Source Pollution Self-Study Guide*, which enables adults to test and increase their knowledge about aquatic ecosystems and NPS. The concept for the guidebook evolved from a 1994 training session for DCR-DSWC field staff who routinely advise property owners about ways to minimize nonpoint source pollution.

The intent of the training was to impart a better understanding of how NPS affects aquatic communities and to instill greater appreciation for the balance that must be maintained to sustain thriving, productive ecosystems. According to Moira Croghan, coordinator of the project, "The training was a great success! But we realized that we didn't have the time and money to replicate similar training for so many others who could benefit from this kind of experience." To solve this problem, the DCR-DSWC developed the guidebook. Croghan notes, "Comments on the self-study guide have been very favorable."

The guidebook is divided into five sections; "Overview of Aquatic Ecosystems," "Nonpoint Source Pollution," "The Impact of Nonpoint Source Pollution on Aquatic Systems," "Positive Effects of Streamside Management Zones and Wetlands," and "How Can I Protect Aquatic Systems?" Each section contains a "Quick Quiz" to test the reader's knowledge of the subject. Questions included on the nonpoint source pollution Quick Quiz include:

- Can you name four types of nonpoint source pollution? (*answer: sediments, nutrients, toxics, and pathogens*), and
- Can you name the most prevalent pollutants in urban runoff? (*answer: heavy metals*).

Each question has a reference point to direct readers to corresponding explanations.

Features such as the "Quick Quiz" make the guidebook a useful tool for nonpoint source managers, educators, and others interested in water quality protection. Funding assistance for the development of the *Aquatic Resources and Nonpoint Source Pollution Self-Study Guide* was provided by the National Oceanic Atmospheric Administration.

[Requests for a single, free copy of the Aquatic Resources and Nonpoint Source Pollution Self-Study Guide should be directed to the Virginia Department of Conservation and Recreation, Attention: Jane Wells, 203 Governor Street, Suite 206, Richmond, VA 23219.]

Directory Describes National Urban Watershed Restoration Efforts

The *National Directory of Urban Watershed Restoration Efforts* provides concise descriptions of 50 urban watershed restoration efforts. Representing every region of the country, these cooperative programs demonstrate a growing commitment to the protection and enhancement of natural resources in the urban environment.

The variety of organizational structures and approaches also reflects a climate of innovation, as communities face the challenges of mitigating the impacts of development. The 50 entries were compiled from an initial list of over 150 contacts. The intent is to highlight projects with physical restoration activities — whether the project's focus is improving water quality, habitat, or wildlife. With this directory, the practitioner designing a restoration project need not feel alone — chances are there is a contact in this book that can provide some useful insight or experience.

[For more information, or a copy of the 50-page National Directory of Urban Watershed Restoration Efforts, send \$6.00 (includes postage) to the Center for Watershed Protection, 8737 Colesville Rd., Suite 300, Silver Spring, MD 20910. Phone: (301) 589-1890.]

Modern Management Methods Topic of New Book on Stormwater Management

Of interest to stormwater management modelers, environmental and hydrological engineers, city planners, developers, and conservationists, *Modern Methods for Modelling the Management of Stormwater Impacts* contains 26 peer-reviewed chapters selected from 40 presentations. It is the third in a series from the International Stormwater and Water Quality Management Modelling Conferences, held annually in Toronto. Contributors include consultants, city engineers, and academicians from the United States and Canada.

The book is divided into three main sections: Education and Planning, Modelling Water Quality, and Data Models and Practical Issues. It also includes an extensive glossary, a comprehensive index, and acronym and program listings. The 500-page book costs U.S. \$50.

[For more information, contact CHI, 36 Stuart Street, Guelph, ON N1E 4S5. Phone: (519) 767-0197; Fax: (519) 767-2770.]

Datebook

DATEBOOK is compiled with the cooperation of our readers. If you would like a meeting or event placed in the DATEBOOK, contact the *NPS NEWS-NOTES* editors. Due to an irregular printing schedule, notices should be in our hands at least two months in advance to ensure timely publication. A more complete listing can be found on the *NPS BBS*.

Meetings and Events

1995

September

- 6-8 *Great Lakes Commission 1995 Annual Meeting and 40th Anniversary Celebration*, Quebec City, Quebec. Contact: Rita Straith, (313) 665-9135. E-mail: rstraith@glc.org
- 10-20 *Karst Waters & Environmental Impacts*, Antalya, Turkey. Contact: A. Ivan Johnson, Karst Symposium '95 Co-Chair, A. Ivan Johnson, Inc., 7474 Upham Court, Arvada, CO 80003.
- 17-20 *Versatility of Wetlands in the Agricultural Landscape*, Tampa, FL. Jointly sponsored by AWRA and ASAE. Contact: Kerry L. Curtis, Manager of Customer Services, American Water Resources Association, 950 Herndon Parkway, Suite 300, Herndon, VA 22070-5528. (703) 904-1225. Fax: 904-1228.
- 18-20 *Third Thematic Conference on Remote Sensing for Marine and Coastal Environments*, Seattle, WA. Contact: Wendy Raeder, ERIM, P.O. Box 134001, Ann Arbor, MI 48113-4001. (313) 994-1200. Fax: 994-5123. E-mail: raeder@vaxc.erim.org
- 20-21 *EASI Leadership Conference*, Chevy Chase, MD. Contact: EASI, 8733 Old Dumfries Road, Catlett, VA 22019. Phone or fax: (703) 788-EASI. For those interested in opportunities for older persons to conserve and protect our nation's environment.
- 22-23 *Sharing Our Vision for Environmental Education; A Five-State Environmental Education Conference* (AR, LA, NM, OK, TX), Dallas, TX. Co-sponsored by the Arkansas Dept. of Pollution Control and Ecology, the Louisiana Dept. of Environmental Quality, New Mexico State Forestry, and the Oklahoma Dept. of Environmental Quality. Contact: Sue Bumpous (512) 239-0049, or Barbara Henry (512) 239-0013.

October

- 2-6 *Linking Land and Water: Third National Nonpoint Source Watershed Monitoring Workshop*, Seattle, WA. Contact: Teena Reichgott, (206) 553-1601.
- 9-11 *Local Solutions to Pennsylvania's Pollution: First Annual Pennsylvania Nonpoint Source Conference*, State College, PA. Sponsored by the Pennsylvania Department of Environmental Resources, the Chesapeake Bay Education Office, and EPA. Contact: Nicki Kasi, Nonpoint Source Program Section Chief, PA DER-Bureau of Land & Water Conservation, P.O. Box 8555, Harrisburg, PA. (717) 787-5259. Fax: (717) 787-9549. Features lessons learned from PA's Chesapeake Bay Program and strategies for statewide nonpoint source programs.

1995

October

- 15-18 *Land Trust Alliance National Rally 1995*, Pacific Grove, CA. Contact: LTA Rally, 333 North Michigan Avenue, Suite 2200, Chicago, IL 60601-4196. (312) 236-6476. Fax: (312) 236-6595. Topics include new conservation tools, fundraising approaches, federal policy, and legal issues.
- 16 *Water Quality Workshops to Precede the First Annual EPA Region VI Nonpoint Source Conference*, Tulsa, OK. Contact: Dr. Mike Smolen, Oklahoma State University, Stillwater, Oklahoma. (405) 744-8414. Workshops include design of sediment control systems; Know Your Watershed; urban IPM; biological monitoring in urban streams; and Farm-A-Syst.
- 17-19 *First Annual EPA Region VI Nonpoint Source Conference*, Tulsa, OK. Contact: Otis Bennett, Cherokee County Conservation District, 1009 S. Muskogee Ave., Tahlequah, OK 74464. (918) 456-1919. Fax: (918) 456-3147. Sponsored by EPA and Region VI states. For managers, technical people, decision makers and the general population.
- 21-25 *WEFTEC '95: The Water Environment Federation's 68th Annual Conference and Exposition*, Miami, FL. Contact: Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314-1994. (800) 666-0206.

November

- 5-9 *AWRA 31st Annual Conference & Symposia*, Houston, TX. Contact: Mark L. Loethen, P.E., Symposium Chairperson, Pate Engineers, Inc., 13408 Northwest Freeway, Suite 160, Houston, TX 77040. Topics include water management in urban areas, advances in model use and development in water resources, and North American water resources.
- 6-11 *15th International Symposium of the North American Lake Management Society on Aquatic Ecosystem Stewardship*, Toronto, Ontario, Canada. (705) 766-2418.
- 9 *Stormwater Management Symposium*, Linthicum, MD. Contact: Lynne Hoot, Executive Director, c/o Maryland Association of Soil Conservation Districts, 53 Slama Road, Edgewater, MD 21307. (401) 956-5771. Fax: (410) 956-0161. The purpose of this symposium is to provide a forum and showcase for policy makers, consultants, and practitioners from a variety of disciplines in both the public and private sector, to discuss issues and new developments related to a holistic, ecosystem-based approach to stormwater management.

Calls for Papers—Deadlines

1995

September

- 30 *AWRA Annual Symposium on Watershed Restoration Management: Physical, Chemical, and Biological Considerations*, July 14-17, 1996, Syracuse, NY. Paper, poster, video, and software proposals requested. Contact: Dr. Jeffrey J. McDonnell, (315) 470-6565.

October

- 2 *Conference on Coast Redwood Forest Ecology and Management*, Humboldt State University, Arcata, CA, June 18-20, 1996. Paper and poster presentations requested. Contact: John W. LeBlanc, University of California, ESPM-Extension Forestry, 163 Mulford Hall, Berkeley, CA 94720-3114. (510) 642-6678. Fax: (510) 643-5438. E-mail: jleblanc@nature.berkeley.edu

December

- 31 *Seventh Annual Florida Lake Management Society Conference*, Ocala, FL, May 22-24, 1996. Paper presentations requested. Contact: The Florida Lake Management Society, c/o Mark Hoyer, U.F. Department of Fisheries, 7922 N.W. 71 Street, Gainesville, FL 32653. (904) 392-9617, ext. 227.

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 FAX (202) 260-1517.

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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