Nonpoint Source
News-Notes
November 2004, #74

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

Notes on the National Scene

Putting NPS Outreach Tools in Your Hands

Do you need to let people in your community understand how they can reduce runoff pollution, but don't have the time, money, or staff to do the job right? EPA's upcoming product, tentatively titled "NPS Outreach Digital Toolbox," can help! EPA believes that it is better to prevent nonpoint source (NPS) pollution through education than it is to control it after it is generated. By creating this new set of resources, EPA hopes to enable and encourage local organizations and governments to lead this education effort.

Enabling the Education Process

Where did the idea for the Toolbox originate? To help address the NPS education and outreach needs of the public, the states (under the Association of State and Interstate Water Pollution Control Administrators) and EPA formed a Nonpoint Source Information Transfer and Outreach Workgroup (Workgroup) in 2000. The mission of the Workgroup is to raise public awareness about NPS problems and solutions and to motivate the public to change their behavior. The Workgroup researched various techniques to learn how best to reach the general public with the NPS message by conducting focus groups and consulting with various behavior change experts. Ultimately, the Workgroup decided that the most effective way to reach the public is by providing information and tools to state and local agencies and other organizations that will enable them to launch their own site-specific NPS pollution outreach campaigns.

The Toolbox will consist of two primary components: (1) a how-to guide for launching successful local watershed outreach campaigns; and (2) sample materials (in digital formats) such as public

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service announcements for TV and radio, billboard signs, and newspapers ads, that could be used and easily tailored to a community's specific needs.

How-to Guide

The how-to guide, released in December 2003, is titled *Getting in Step: A Guide for Conducting Watershed Outreach Campaigns*. *Getting In Step* provides the overall framework for developing and implementing an outreach campaign in concert with an overall water quality improvement effort. It presents the outreach process as a series of steps, each building on the previous ones.

The steps are as follows:

1. Define the driving forces, goals, and objectives
2. Identify and analyze the target audience
3. Create the message
4. Package the message
5. Distribute the message
6. Evaluate the outreach campaign

Throughout the guide, sidebars provide specific examples, key concepts, and recommended resources for obtaining more information. The guide is an update of the popular 1998 *Getting In Step: A Guide to Effective Outreach in Your Watershed* published by the Council of State Governments and funded by EPA. The new guide explains how to develop strategies and tailor campaign materials to reach the critical target audience. It includes more details on working with the media, developing public service announcements, and hosting different community events. In addition, the updated guide provides information on using social marketing techniques to promote changes in behaviors and lifestyles within target audiences.

EPA's *Getting in Step* Guide Enjoys Wide Acceptance

More and more people are becoming fans of EPA's *Getting In Step: A Guide for Conducting Watershed Outreach Campaigns* in both book and video form. In the first year since these resources were published by EPA, approximately 4,000 sets have been distributed through a popular series of workshops and individual orders. The book and video were reprinted in Fall 2004, so the nearly depleted stocks have been replenished. Find out for yourself what thousands of communities have already discovered about improving returns on their limited watershed outreach dollars. Order your free set by calling EPA's National Service Center for Environmental Publications at 800-490-9198 and request publication #841-B-03-002 (book) and #841-V-03-001 (video).

The guide is accompanied by a 35-minute video that showcases four watershed campaigns around the U.S. and the outreach techniques used to accomplish each community's goals. To download a copy of the guide or order a free copy of the video, visit www.epa.gov/nps/outreach.html, or refer to the ordering information in the sidebar.

Ready-To-Use Materials and Templates

To make implementation of an outreach strategy as simple as possible, the NPS Outreach Digital Toolbox will also include a menu-driven CD-ROM that contains numerous sample materials and templates. Distribution of the CD product over the Web and a more complete DVD version are also planned. The Workgroup researched different NPS outreach campaigns around the country and selected materials that have been tried and tested. All materials will be made available to the public either as they are or with restrictions specified. EPA intends for state and local agencies and organizations to customize many of these materials simply by adding local contact information or watershed-specific facts, or to use them to get ideas for their own outreach messages. Users will find a variety of useful resources, including:

- Television and radio public service announcements
- Print ads in a variety of formats from billboards to newspaper ads

Putting NPS Outreach Tools in Your Hands (continued)

- Proven slogans, mascots, and ready-to-use logos (black/white and color) to help unify a community's campaign
- Printer-ready samples of popular posters, bookmarks, fact sheets, brochures, and more to help spread the word about how each citizen can combat NPS pollution

A beta version of the NPS Outreach Digital Toolbox should be available for public testing by March 2005, with a final release scheduled for August 2005. If you have any materials you would like considered for inclusion in the Toolbox, please send an e-mail to Don Waye, of EPA's NPS Control Branch, at waye.don@epa.gov.

EPA's Watershed Academy Web Expands Offerings

Since its inception in 1996, the U.S. EPA's Watershed Academy Web has provided training and educational materials for a wide variety of professionals and citizens alike. This on-line training and certificate program gives users free access to a valuable array of watershed topics in 49 separate training modules, all peer reviewed and designed for user friendliness. The modules are categorized into six themes ranging from watershed ecology to social, community, and legal aspects of watershed management. The Watershed Academy Web covers many disciplines involving watershed management at introductory and intermediate levels to provide a broad understanding of watershed approaches that can be used in real-world settings. Enough material exists in these modules to provide approximately six weeks worth of training, illustrating the wealth of information available in this program. A free CD version that includes 44 of the modules is available to those who might have limited or slow Internet access.

To graduate from the Watershed Academy Web Certificate Program, participants need to complete, and get passing grades on, 15 of the 49 modules—12 of which must be from the core modules list. Grades are determined by automated on-line tests given at the end of each module. Since the certificate program began in 2001, there have been over 800 graduates from 48 states and 22 countries. The program now produces graduates at the rate of one per day. Graduates of the program have come from a wide variety of disciplines. Doug Norton, EPA's Project Manager for the Watershed Academy Web, was surprised by the feedback he received from people of all different backgrounds, including surface mining biologists, air force employees, ranchers, professors teaching watershed courses, international aid workers, and more. The multi-disciplinary approach of these training modules caters to just about anyone interested in learning watershed-related concepts.

The most recent addition to the Watershed Academy Web is a course on the *Fundamentals of the Rosgen Stream Classification System* (under the Analysis and Planning Theme). The module summarizes the basic Level 1 and Level 2 techniques for classifying stream channel types according to the Rosgen classification system, which is one of the most widely used methods for stream classification in the country. The popularity of this system is due to its basis in fluvial geomorphology and natural stream formative processes, its use of common geomorphic principles and field measurement techniques, its relationship to stability or instability of the stream channel and channel evolution, and relating all of the above to stream restoration principles and practices.

Upcoming additions to Watershed Academy Web include *Better Site Design* (for minimizing impacts of new developments); *The Effects of Impervious Surfaces*; *Fundamentals of Earth Management for Building Sites, Roads, and Recreational Construction*; and *Working with Landowners on Restoration Projects*. This frequently-updated set of learning materials is what keeps the Watershed Academy Web relevant today. For on-line training or directions on how to get the free training CD, visit www.epa.gov/watertrain and start your training now!

Downspout Disconnections Leave Portland Waters Cleaner

In recent years, billions of gallons of stormwater runoff mixed with untreated sewage had been pouring into the Columbia Slough and Willamette River through combined sewer overflows in Portland, Oregon. When the combined sewer system was first built in the late 1800s, all sewage was directed to Portland's rivers. In 1952, a treatment plant was built to remedy this problem. The population of Portland was much smaller back then than it is now, and the system accommodated the combined flow of sewage and stormwater runoff. As the city grew, so did the sewage and stormwater volume, eventually overwhelming the combined system capacity almost every time it rained. Fortunately, the city of Portland and its dedicated residents are working together to successfully make the overflows a distant memory.

Is the Water Safe?

Portland's waters have traditionally been a favorite destination for swimming, boating, water skiing, and other recreational water activities, but with the advent of the combined system overflows (CSO), the water was no longer safe for these activities. These overflows contained not only stormwater but also untreated human and industrial waste, toxic materials, and debris. Portland's Environmental Services, a city-owned utility providing residents with water quality protection, sewage treatment, wastewater collection, and sewer installation, found it necessary to issue CSO advisories each time it rained between mid-May and mid-October, which happened to coincide with the season of peak recreational water use. Environmental Services also issued a blanket advisory during the rainy season in winter and early spring. Something had to be done.

Removing the Threat

Portland actively began to address its CSO problem in 1991, in response to a lawsuit-driven mandate by the Oregon Department of Environmental Quality (DEQ). The DEQ required that Portland address its CSO problem within 20 years, or by 2011. In response, Portland's Environmental Services launched a group of projects in 1991 to remove and/or temporarily store a significant amount of the runoff that enters the combined system. These projects include downspout disconnection, installation of sumps, diversion of surface flow, creation of stormwater and overflow storage, separation of combined sewers, and treatment of sewer overflow. The projects that require new infrastructure began in 1991 and are continuing. In the meantime, Environmental Services has had great success with its voluntary Downspout Disconnection Program (DDP), which reduces CSO by redirecting roof runoff away from the combined system.

Downspout Disconnection Program

The city of Portland's Environmental Services and Office of Neighborhood Involvement partnered in 1995 to create the DDP. Lauren Norris, Community Involvement Coordinator of the DDP, developed a DDP Web site and a series of fact sheets. She has relied on help from almost 140 AmeriCorps volunteers, who canvassed and surveyed neighborhoods, assisted with curriculum development and implementation for the middle schools, and distributed DDP information. The volunteers also learned how to disconnect downspouts, and taught this skill to other volunteers with partner community organizations, such as neighborhood associations, middle and high school groups, churches, and others.

Volunteers help disconnect a downspout.

Residents in targeted areas are offered the option of either having their downspouts disconnected for free, or being paid $53 to do it themselves (supplies cost $15 to $20). The city provides do-it-yourself instructions, and will provide supplies upon request (with the cost being subtracted from the reimbursement). "Approximately 50 percent of participants want to do the work themselves," explained Norris. For the other 50 percent wanting it done for them, the city relies primarily on its AmeriCorps and

Downspout Disconnections Leave Portland Waters Cleaner (continued)

community organization volunteers. Participating community organizations earn $13 for each downspout disconnected by one of its volunteers. This incentive helps solve a pollution problem, saves money, invests in the community, and instills stronger ties and stewardship over local watersheds. Since 1995, more than 5,000 volunteers have helped disconnect approximately 15,000 downspouts, earning more than $200,000 for their community causes.

What Does a Disconnect Involve?

In the targeted areas, the typical property's downspouts are connected to pipes that lead directly to the sewer. To disconnect, a downspout is cut and an elbow joint is put in place to direct the roof runoff into an extension that releases the water on the ground surface beyond a required minimum distance from the structure. Residents may also choose an extension that folds up against the drain pipe in dry weather, and drops down onto the ground during a rain. The disconnected sewer pipe is then capped.

Occasionally, alternative systems have been installed in areas with obstructions or inadequate space. For example, rain barrels or cisterns have been added to store roof runoff for later use in the yard or home. Some homeowners prefer an underground system serving one or more downspouts. Generally small enough to be dug by hand, these systems include dry wells, soakage trenches, or gravel pits that allow water to disperse into the groundwater.

Rain Barrel Versus Cistern

A rain barrel is constructed of a storage container (barrel, trash can, etc.) typically holding at least 50 gallons or more. The rain barrel is connected to the roof downspout, includes an overflow pipe, and empties through a spigot. Cisterns are similar to rain barrels, but are more elaborate—they are often constructed of concrete, have a greater storage capacity, and can be built to serve some in-house water needs such as toilet flushing and clothes washing. A cistern costs significantly more than a rain barrel, but in certain areas can offset water costs enough to be economically feasible in the long run.

The DDP is Making a Difference

The DDP is helping the city meet its CSO-reduction requirements, and it seems to be widely accepted and appreciated by the public. Homeowner George Karlson remarked, "Disconnecting your downspouts is important for the environment—I had it done on my house and it works great." Norris appreciates the willingness of property owners to participate in the program. "It may not seem like one house would make a big difference, but it can really add up," she explained. "Approximately 42,000 properties have disconnected their downspouts, resulting in the removal of almost 942 million gallons of stormwater from the sewer." The DDP's goal is to have at least 51 percent of the roof area of 70,0000 properties in each of the targeted areas disconnected by 2011. They have met that goal in the Columbia Slough basin targeted area, and are still working to meet it in the Willamette River basin targeted area. Once they meet their 51 percent goal in both areas, they may continue the program if ongoing stormwater flow analysis and data collection indicate that a greater reduction in stormwater flow is needed. At the current rate, the DDP staff will likely achieve all of their goals long before the mandated date of 2011.

Achieving Success at CSO Abatement

In 2000 Portland completely eliminated CSOs to the Columbia Slough, which empties into the Columbia River. The city's achievement is due to a number of successful projects, most notably the downspout disconnection program, which removed 52 percent of all roof runoff from the combined system in that area, and the completion of the Columbia Slough Big Pipe, which stores excess runoff and sewage overflow water until it can be treated and released. The city is continuing work on Portland's Willamette River drainage area, and expects to eliminate 94 percent of the CSO by 2011. For more information on Portland's ongoing CSO abatement projects, visit www.portlandonline.com/cso.

[For more information, contact Lauren Norris, Downspout Disconnection Program, City of Portland Environmental Services, 1120 SW 5th Ave. Room 1000, Portland, OR 97204. Phone: 503-823-3086; e-mail: laurenn@bes.ci.portland.or.us; Web: www.portlandonline.com/oni (see "Disconnect my downspouts" link on the left side).]

Phosphorus Fertilizer Restrictions Spread Across Minnesota Lawns

Minnesota is forging ahead with efforts to curtail the amount of phosphorus finding its way into the state's lakes. Minnesota recently became the first state in the nation to enact a statewide law requiring that most lawn fertilizers applied contain zero percent phosphorus. The new law, which takes effect January 1, 2005, requires those who fertilize established lawns to use only fertilizers without phosphorus, unless a soil test indicates phosphorus is needed. The law applies only to fertilizers used on established lawns and not to fertilizers used on farms, trees, flower or vegetable gardens, golf courses (applied by trained staff), and new lawns.

The law expands a similar phosphorus restriction that took effect January 2004, which required people to apply zero percent phosphorus fertilizer in the Minneapolis/St. Paul ("Twin Cities") metropolitan area, and up to three percent phosphorus fertilizer in the rest of the state (see News-Notes Issue #71 for more information on the January 2004 law—www.epa.gov/newsnotes). The Minnesota Department of Agriculture (MDA), along with the University of Minnesota Extension Service, fertilizer industry representatives, citizen groups, and others, have been tasked with educating stakeholders throughout the state to ensure the new restrictions are met.

Too Much Phosphorus Poses a Problem

In most freshwater systems (e.g., lakes, rivers, and streams), phosphorus is a limiting nutrient. Other nutrients, such as nitrogen and potassium, are needed for freshwater plant growth, but they usually exist in adequate levels. In such systems, phosphorus loadings control the growth of algae, so even small amounts of phosphorus entering a lake can go a long way toward stimulating runaway growth of algae and other aquatic plants. When unnaturally high levels of phosphorus reach freshwater systems, plants can grow unchecked, causing a proliferation of algae and aquatic weeds to the detriment of other organisms that share the ecosystem. An overabundance of surface algae prevents important sunlight from reaching organisms beneath the surface. Often, this unsustainable growth of algae (called a bloom) reaches a critical mass that triggers a catastrophic die-off of the bloom. As the bloom decays and sinks, it depletes the essential free oxygen from the aquatic habitat, typically resulting in mass kills of desirable organisms.

Why the New Law?

State legislators expanded the restriction statewide primarily to improve water quality across Minnesota over the long-term. The phosphorus restriction isn't expected to yield notable water quality improvements for at least a few years, explained Jerry Spetzman, Water Quality Advisor with the MDA. "Even if we stop most phosphorus inputs from fertilizers, we are still faced with many other sources. However, eliminating this one major source will help our overall efforts."

Expansion of the restriction also helps keep state laws consistent, adds Spetzman. "Having a restriction of zero percent phosphorus in the Twin Cities area and three percent for the rest of the state was confusing and difficult to communicate to the public. The new law will make our education job easier."

Education is Key for Success

The state is focusing on education, rather than enforcement, as the key to successful enactment of the law. The law leaves the choice of enforcement up to local units of government. "Given their limited resources, we don't expect governments to put staff time into fertilizer patrols," noted Spetzman. "Rather, we plan to educate the consumers and continue working closely with the decision-makers in the stores to ensure that they have the correct products readily available."

Education Materials Available

The MDA and several partners developed a series of educational materials to support the 2004 law restricting phosphorus in the Twin Cities area. These materials, revised to reflect the law's statewide restrictions, include fact sheets, brochures, booklets, and posters. The materials are available for download at www.mda.state.mn.us/appd/ace/lawncwaterq.htm.

Ron Struss, Regional Extension Educator with the University of Minnesota Extension Service, agrees with Spetzman that reaching those who supply the landowners with fertilizer is critical. "The law restricts use, not sale of phosphorus lawn fertilizer. Stores can sell what they want, and consumers can buy what they want. However, those applying lawn fertilizer must use the correct product, which, after January 1, 2005, will be zero percent phosphorus statewide in most cases. Stores need to stock zero percent phosphorus lawn fertilizer so consumers can buy and use the correct product."

Consumer education materials will help the public understand that most soils in Minnesota have adequate levels of phosphorus, and most lawns don't need the additional phosphorus often applied in fertilizer. "Most lawns will continue to be healthy without the addition of phosphorus in lawn fertilizer," emphasized Spetzman. "They will not turn brown and die." Fortunately, lawn care companies are aware of this and have been using low- or no-phosphorus fertilizer for years. As more consumers learn and adapt, they begin looking for phosphorus-free product.

Stores Slowly Make the Change

Experience with the enactment of the Twin Cities' law shows that some stores are more proactive than others. Before the Twin Cities' law was enacted, researchers from University of Minnesota performed a survey and found that 5 to 10 percent of the fertilizers sold were zero phosphorus. After the law, the majority (70 to 80 percent) of the lawn fertilizers available within the metro area

were labeled phosphorus-free. Some stores took longer to adjust because they needed to sell their large inventory of phosphorus-containing fertilizer before they could bring in phosphorus-free products.

Struss expects a similar change in store inventory statewide after the law goes into effect. Some stores across the state are already making phosphorus-free fertilizer available, noted Struss. "In those cases a homeowner who walks in not knowing the law will probably buy a phosphorus-free product anyway because it is readily available and on display. In other stores the phosphorus-free product is there but you still have to look for it. This leads many consumers to purchase fertilizer with unnecessary phosphorus."

Many of these stores are coming around, thanks to the state's education efforts and the demands of the consumers. "More and more consumers are becoming aware of the new law and requesting phosphorus-free products," explained Struss. "Consumers complain to store managers when they can't find the correct product, and this causes the stores to proceed with changing their inventory. Hopefully, consumers needing fertilizer with phosphorus will soon be the ones hunting through the shelves."

[For more information contact Jerry Spetzman, Minnesota Department of Agriculture, 90 West Plato Boulevard, Saint Paul, Minnesota 55107. Phone: 651-297-7269; e-mail: jerome.spetzman@state.mn.us; Web: www.mda.state.mn.us/appd/ace/lawncwaterq.htm.]

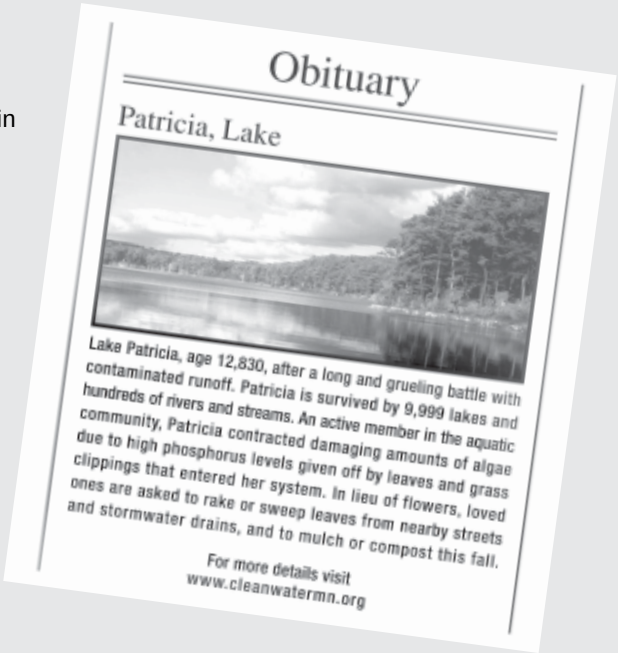
Finding the Correct Fertilizer

To comply with Minnesota's new law, lawn fertilizer consumers need to check the string of three numbers on the fertilizer bag. These numbers show the fertilizer's analysis: percent nitrogen–percent phosphorus–percent potassium (e.g., 22–0–15). A "zero in the middle" means phosphorus-free fertilizer. The 100-pound bag of the fertilizer shown here contains 22 pounds of nitrogen, no phosphorus, 15 pounds of potassium, and 63 pounds of ballast (material on to which the nutrients are sprayed to allow spreading).

Unusual Obituary Attracts Attention to Water Quality Cause

Complying with fertilizer restrictions aren't the only way Minnesotans are being asked to protect their lakes. In late 2003, the unique obituary pictured on the right ran in two Twin Cities' papers.

The obituary was published by Metro WaterShed Partners, a coalition of over forty public, private and non-profit organizations in the metropolitan area of Minneapolis/St. Paul, Minnesota. The obituary, written for the fictional Lake Patricia, was designed to draw attention to the group's "Minnesota Water—Let's Keep It Clean" educational campaign and Web site (www.cleanwatermn.org). The campaign teaches Minnesotans how to protect lakes, rivers, and streams from stormwater runoff pollution, and provides materials that cities, counties, and watershed educators can use to meet the public education requirements of their federal and state stormwater pollution prevention plans.



Obituary

Patricia, Lake

Lake Patricia, age 12,830, after a long and grueling battle with contaminated runoff. Patricia is survived by 9,999 lakes and hundreds of rivers and streams. An active member in the aquatic community, Patricia contracted damaging amounts of algae due to high phosphorus levels given off by leaves and grass clippings that entered her system. In lieu of flowers, loved ones are asked to rake or sweep leaves from nearby streets and stormwater drains, and to mulch or compost this fall.

For more details visit www.cleanwatermn.org

Ron Struss, Regional Extension Educator with the University of Minnesota Extension Service, notes that the obituary was extremely successful in generating media attention and public interest in the program. "We ran the obituary five times in local newspapers, and ended up with a great deal of additional free program coverage in newsletters, on the radio, and on television."

The obituary is available for download at www.cleanwatermn.net/pdf/PatriciaAd.pdf, and may be modified for use as an attention-grabbing outreach tool in your community. For more information contact Ron Struss at ron.struss@cleanwatermn.org or 651-215-1950.

New Jersey Adopts Tough Urban Runoff Rules

New Jersey, the nation's most urbanized state, adopted what is likely to be the most protective urban runoff program in the U.S. earlier this year. The unprecedented scope of this program mandates water quality protections ranging from 300-foot wide stream buffers to storm drain labeling across the state.

For more information on EPA's Phase II stormwater rule, see www.epa.gov/npdes/stormwater.

The ambitious runoff management program is the product of two new sets of rules. The first codifies the state's approach for complying with EPA's Phase II stormwater rule, and includes statewide requirements for every part of the state, even municipalities that are not subject to the Phase II rule. The second focuses on how municipalities across the state must regulate new development and redevelopment.

Statewide Stormwater Permits

With regard to the first set of rules, New Jersey has adopted a two-tier approach to managing urban runoff, assigning its 566 contiguous municipalities to one of those two tiers. Nearly all municipalities must obtain either a Tier A general permit or a Tier B general permit. Municipalities that meet the federal definition of urbanized areas under EPA's Phase II rule and all coastal communities are subject to the more stringent requirements of the Tier A general permit. In all, the state has assigned 464 municipalities to Tier A. Nearly all of the remaining 102 municipalities are subject to the Statewide Basic Requirements (SBRs) of the Tier B general permit. But New Jersey didn't stop there; beyond regulating municipalities, the state established two similar types of general permits—one for all highway agencies (including all county highway departments and transportation and port authorities) and another for public complexes with over a thousand people, such as public colleges, military bases, prisons, and hospitals.

New Jersey's new rules differ from EPA's Phase II rule in several important ways. Under EPA's municipal separate storm sewer system (MS4) stormwater rule, localities are granted significant latitude on how they can comply with a suite of six minimum control measures to manage stormwater. New Jersey has taken a decidedly more prescriptive approach to ensure greater consistency and thoroughness statewide. For instance, EPA's Phase II rule requires a public education component but does not specify what form it must take. By contrast, all New Jersey municipalities are required by their stormwater permits to label most storm drain inlets with "don't dump" messages by 2009. Additionally, every municipality in the state must conduct at least one public outreach campaign each year. To encourage consistency, and to ease costs to municipalities, the state created standardized public education materials for use by all municipalities. The state is also conducting its own statewide nonpoint source public outreach campaign to leverage local efforts. Beyond these public education elements, each municipality across the state is required to develop a formal stormwater management plan and pass a stormwater control ordinance. Finally, both stormwater permits call for each municipality to ensure long term operation and maintenance of best management practices (BMPs) installed for new development.

The 464 municipalities with Tier A permits must go beyond the common elements described above. Among other requirements, these municipalities must:

- Perform monthly street sweeping in predominantly commercial areas;
- Enact ordinances for controlling pet waste, litter, improper waste disposal, illicit connections into MS4s, yard waste, and wildlife feeding; and
- Conduct annual catch basin cleaning and regularly maintain all other stormwater facilities that are operated by municipalities.

The New Jersey Department of Environmental Protection (DEP) has developed and posted on its Web site a statewide BMP manual, model ordinances and other standardized resources to help municipalities comply with the new Tier A and Tier B permit requirements (see www.njstormwater.org). These resources have also been compiled on a CD and provided to all 566 municipalities across the state in spring 2004. Perhaps most importantly to the municipalities, New

New Jersey Adopts Tough Urban Runoff Rules (continued)

Jersey has made six million dollars in fiscal year 2004 grants available to help local governments comply with the new rules, and intends to provide similar levels of grant funding in upcoming years.

300 Foot Stream Buffers in Critical Watersheds

The second set of regulations updates New Jersey's Stormwater Management Rules for the first time since they were adopted in 1983. While the updated statewide rules provide many progressive water quality protections against the impacts of new development and redevelopment, the provision that has received the most attention is the requirement for 300 foot buffers along 6,093 stream miles. The buffer, known as a "special water resource protection area," excludes new development within 300 feet from the top of each stream bank for New Jersey's highest quality waters and their tributaries. An infill provision, consistent with New Jersey's previous smart growth commitments, allows for this buffer to be reduced to 150 feet in previously developed areas. Streams and waterbodies are designated for this buffer protection if they lie in critical drinking water supply watersheds or ecologically sensitive areas.

The (Rain) Garden State

The updated statewide rules also call for significantly greater control of runoff from new developments that have disturbed at least one acre of land or that have increased imperviousness by at least a quarter acre (collectively referred to as "major developments"). Under the strengthened rule, the anticipated increase of total suspended solids (TSS) loadings from post-construction major development plans over pre-development conditions must be reduced by 80 percent, and nutrients must be removed "to the maximum extent feasible." Further, most new major developments must either maintain 100 percent of the average annual pre-construction groundwater recharge volume onsite or infiltrate the projected increase in stormwater volume from pre- to post-construction conditions for a two-year design storm. There are notable exceptions to this requirement: for designated "urban redevelopment areas" (to promote certain infill and other smart growth areas) and stormwater from "high pollutant loading areas." Finally, for major development plans that cannot demonstrate no increases in either runoff volumes or peak flows for the 10 and 100 year design storms, they must control significant percentages of the projected peak runoff increases for these design storms. To achieve all of these objectives (minimizing runoff volumes and pollutant loads and maximizing groundwater recharge), the rule strongly encourages nonstructural and low impact development (LID) practices like rain gardens and other bio-retention techniques (see box).

[For more information on New Jersey's Phase II stormwater rules and permits, contact Bruce Friedman, NJDEP Project Manager, Municipal Stormwater Regulation Program at 609-633-7021. For questions on New Jersey's Stormwater Management Rules, contact Larry Baier, NJDEP Director, Watershed Management Division at 609-984-0058. Information on both sets of rules is available online at www.njstormwater.org.]

LID and Nonstructural Practices Emphasized in New Jersey: A Peek Inside New Jersey's Stormwater Management Rule

New Jersey's New Stormwater Management Rule calls for nonstructural stormwater management strategies to be incorporated into the design of a project or site "to the maximum extent practicable." Section 7:8-5.3(b) of the New Jersey Administrative Code states that Nonstructural stormwater management strategies incorporated into site design shall:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;
3. Maximize the protection of natural drainage features and vegetation;
4. Minimize the decrease in the "time of concentration" from pre-construction to post-construction;
5. Minimize land disturbance including clearing and grading;
6. Minimize soil compaction;
7. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides;
8. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas; and
9. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff.

Watershed Group Partners with Town to Control Construction Runoff

Why try to treat a sediment pollution problem when you can prevent it instead? That is the driving force behind the Upper Sugar River Watershed Association's (USRWA) participation in a "groundbreaking" effort in one of its local municipalities. Rather than being frustrated by non-existent or failing erosion and sediment (E&S) control practices at development sites, USRWA is now collaborating with the municipality, the county, and the state to devise new approaches to E&S control.

The 170 square-mile Upper Sugar River watershed is located just west of Madison, Wisconsin, in Dane County. "Development in the area is exploding, leaving a lot of bare ground available for erosion," explained Frank Fetter, Executive Director of the USRWA. "At the same time, budget constraints have caused cuts in local government agency personnel who might otherwise be available to enforce erosion control. Many developers don't have the technical knowledge or incentive to implement E&S controls properly, especially without adequate oversight." The Village of Mt. Horeb, located in the watershed's headwaters, was a good example.

Tackling a Tough Problem

"Before we started our outreach program, we saw serious erosion in many of Mt. Horeb's ongoing development projects," explained Fetter. "Some developers found it less expensive to pay the occasional fine than to put adequate E&S control practices in place. Others were lax about maintaining the practices they did have. They didn't understand or appreciate the environmental consequences of their actions." The hilly topography of the village exacerbated the erosion control problem. For years the USRWA encouraged the village to step up inspections and enforcement, to no avail. Then, in November 2003, everything changed.

After a dry summer and fall, Dane County received 1.5 inches of rain in an 18-hour period. This event "was the straw that broke the camel's back," noted Fetter. One of the Upper Sugar River tributaries, Deer Creek, had been receiving sediment eroded from construction sites during rains prior to November 2003. The November rain event introduced an extremely large sediment load from one particular development project that had few erosion controls in place.

This sediment load further degraded Deer Creek and completely silted in several fish habitat structures placed by the Wisconsin Department of Natural Resources (WDNR), USWRA, and other groups. The partners had invested significant time and money to improve the water quality and fish habitat in Deer Creek and many other top-class trout waters. Seeing the restoration efforts completely undone by construction-related erosion motivated the WDNR to force the village to fix its problems. The WDNR discussed options with the village, including the possibility that WDNR would require the village to repay a large amount of grant money if the village did not improve its E&S control program. The village finally recognized the seriousness of the situation and began making changes.

Seeking Solutions

The village worked closely with USRWA, Dane County, and WDNR to identify opportunities for improvement. Recognizing the need for better oversight, the village implemented an additional property inspection. The village now inspects each lot after it is graded and before any actual construction occurs to ensure that all E&S control practices are properly installed. The village's building inspector also visits all construction sites every time rain is forecast to see if these practices are still in place. If he sees a problem, he will issue a citation and tell the site manager to have it fixed by the end of the day. The inspector will check back, and, if the problem is not addressed, he

Watershed Group Partners with Town to Control Construction Runoff (continued)

will issue a "stop work" order. This is a notable achievement, explained Fetter. "Prior to the village's collaboration with the USRWA and the state and county, the inspector issued almost no citations or stop work orders. Now he claims to average five to seven citations and three stop work orders per week."

The village also realized that it could benefit from the USRWA's expertise in stormwater and E&S control. In Spring 2004, the village began inviting the USRWA to attend all pre-construction meetings, at which a developer presents final site plans to the village. These meetings provide an opportunity for the USRWA to not only educate the developer about stormwater control, but also to suggest improvements, if needed, to the erosion and sediment control portion of the plan. "Most local developers grew up in the area, and have a 'hook and bullet' ethic," explained Fetter. "They enjoy fishing and hunting and can relate to our discussions on the need to protect habitat. At the pre-construction meeting we provide them with a Stormwater 101 course, but we work in slides of big trout to keep their interest." Together with village officials, USRWA has met with seven different developers so far this year, and has been instrumental in shaping the E&S controls now in place.

Collaboration Pays Off

The positive response from developers has been overwhelming, noted Fetter. "We are finding that the developers want to do the right thing. Our stormwater presentation helps them understand how erosion impacts the environment and why the laws are in place." The meetings have also established dialogue between the USRWA and the developers. "We are available to answer any questions or to provide input. One developer recently asked to meet with us at his site to discuss ways to make his development as low-impact as possible, even before he went to the village with his concept plan," said Fetter. Fetter hopes to eventually be invited to attend and provide input at all concept plan meetings, which is the first meeting between the village and a developer concerning a potential new development. "We're getting there . . . one step at a time," he added.

Seeing the benefits of stormwater education, the village asked the USRWA to host annual half-day stormwater and E&S control workshop for all developers, beginning in early 2005. Developers will receive a certificate acknowledging that they completed the workshop, and will need to show the certificate anytime they apply for a building permit. Non-certified developers will likely be ineligible for permits. "We are planning to create a VHS/DVD of the workshop we hold," explained Fetter. "Any new developer requesting a permit after the date of the workshop will be allowed to view the educational video. They will be granted a special certificate to carry them until the next live workshop—which they must attend." If this stormwater certification program model is as successful in Mt. Horeb as hoped, the USRWA will expand it throughout the entire watershed, added Fetter. "By late 2008 we hope to offer an annual workshop in each major municipality, as well as two to serve rural areas, small municipalities, and townships."

USRWA points to local developer Capitol Underground as a model for others to follow. The company installs and maintains silt fences as needed, grades the site in small phases, leaves grassed buffers, and places piles of crushed stone in runoff ditches (called "stone weepers") to slow water and prevent sediment from leaving the site.

To date, the village and the USRWA have had the most success working with developers planning and building large plat-level subdivisions. The village and the USRWA hope the workshop will be the key to reaching the developers of individual lots of less than an acre, who don't have to meet with the village to discuss plans before or during construction. "Many of the contractors are not on-site, and controlling subcontractors is proving problematic," explained Fetter. "No one wants to take responsibility for the E&S. The grading contractor puts in the E&S controls initially, but is

Watershed Group Partners with Town to Control Construction Runoff (continued)

not expected to maintain them. Other contractors come in and tear up the lot and the silt fence while they are doing their portion of the work—and they just leave it that way. Most of the erosion from new development this spring and summer continues to be from these individual lots."

Maintaining a Presence

The USRWA tries to remain aware of all ongoing construction activities in Mt. Horeb. Several USWRA staff and board members visit construction sites and report problems to the village inspector for follow-up. "We don't necessarily go looking for problems," explained Fetter, "but we do take notice of construction sites when we are driving around. The developers know we are out there, which serves as an additional incentive for them to keep on top of their E&S control practices."

The USRWA tries to reward developers who consistently do a good job, emphasized Fetter. "We mention them in our quarterly newsletter and in the newspaper when possible. We also write them a letter recognizing their efforts and tell them that they may use our endorsement in their marketing materials." The USRWA plans to develop an official recognition program in the future.

Seeing Success on the Ground

The village's new approach has already paid off for the Upper Sugar River tributaries. In May 2004 the area received seven inches of rain over a 72-hour period. "This period of storms was much more severe than the one in November 2003, but the erosion damage in the developments was much less than it was in November,"said Fetter. "There was still damage, to be sure, but it was by far less than we saw elsewhere outside of the village jurisdiction where E&S control practices are still not well maintained. That shows that the practices work, as long as they are installed and maintained properly." Fetter is optimistic that the partnership between the USRWA, Dane County, WDNR, and the Village of Mt. Horeb will show continued success, and will become a model that can be expanded throughout the watershed and beyond.

[For more information, contact Frank Fetter, Upper Sugar River Watershed Association, P.O. Box 314, Mount Horeb, WI 53572. Phone: 608-437-7707; e-mail: execdr@usrwa.org; Web: www.usrwa.org.]

Septic System Initiative Keeps Alive Beach Town's Vision

A legend of North Carolina's Outer Banks tells the tale of how the Town of Nags Head, North Carolina, earned its name: 18th century pirates would hang a lantern around the neck of a horse—an old, gentle nag—and make her walk along the ridges of the tallest sand dunes along the East Coast. Merchant ships traveling up the Gulf Stream would mistake the light for that of another ship, anchored in a secure harbor. Thus fooled, they would change course to follow suit and become stranded in the shallows off this stretch of barrier island, where they were easy prey for pirates. Today, however, visitors no longer have to be tricked to crash on the beach along Nags Head. In fact, each summer, the Town's population swells from its 2,800 year-round residents to roughly 50,000 people. And with all the sun, surf, and turf, probably the last thing on these vacationers' minds is what they should and should not flush down the toilets. But in order to protect the environment and the integrity of the Town of Nags Head, officials are working to convince its citizens and vacationers to pay attention to how they treat septic systems in this fragile barrier island environment.

Adequate lot spacing within the Town is key to septic system success.

Preserving a Family-Oriented Vision

According to Nags Head's vision statement, the Town is "working to build a community with an economy based on family vacation tourism." This base primarily relies on single family beach homes. The Town's mayor, Robert Muller, felt that installing a centralized wastewater treatment plant would ignite the Town's growth, thus extinguishing its vision as a small, family-oriented vacation spot. The Mayor knew that to preserve this vision, steps had to be taken to maintain the Town's current onsite septic systems. Muller declared, "We've known for a long time that onsite waste disposal was an important element in building a vision of the community." The Mayor was not alone. Bruce Bortz, the Town's Deputy Director for Planning and Development, noted, "Our elected board has made it very clear that they're not in favor of a central or municipal sewage plant." Bortz explained that the Board feared that the Town's family-oriented character would be forever changed by higher population densities that a centralized sanitary sewer system might attract. The Town thus decided to develop a multi-pronged strategy for improving the management of its estimated 3,000 septic systems.

History of the Septic Health Initiative

In 1999 the Town developed a four-pronged Septic Health Initiative, which includes an Education Program, a Septic Tank Pumping and Inspection Program, a Water Quality Monitoring Program, and a Decentralized Wastewater Management Plan. The Town receives no outside grant money for the Septic Health Initiative. Instead, the initiative is funded through the Town's water fund. "The programs cost $250,000 a year, but when you compare that to the cost of operating a central sewerage system for three to four million gallons of wastewater a day, it's cheap," Muller said.

Educating the Public

With the influx of vacationers and nonresident property owners, one of the most important facets of the Septic Health Initiative is the Education Program. Septic Health Coordinator Todd Krafft said that the program educates the public by distributing stickers, brochures, door hangers, pens, and letters to the property owners and the realtors who rent out properties. The materials convey messages about items that should be kept out of toilets and other drains—diapers, cigarette butts, feminine hygiene products, and certain solvents and detergents. The Town takes the educational component of the program even further by making presentations at area schools, organizations, realtor groups, civic associations, and community associations to educate the public about the do's and don'ts of maintaining septic systems. "About 80 or 90 percent of property owners are not residents and the majority of those come from areas where there is central sewage, so they're not familiar with onsite wastewater disposal systems," Muller said. "That means that we have an educational job to do."

Inspecting and Pumping

The Septic Tank Inspection and Pumping Program offers up to $95 in incentives to property and business owners who have their tanks inspected and pumped. They receive a full refund for an inspection of a conventional septic system ($65) if done by a Town-approved contractor. If the inspection determines that a tank needs to be pumped, and the property owner does so, the owner also receives a $30 voucher towards his or her next water bill. To assist property owners with failing systems, the Town offers low interest, three-year loans up to $3,000 to repair or replace the system.

Contractor performing drainfield repair for a loan recipient.

"One of the challenges we have is that we don't have the authority to require people to do these things. So we had to find a way to get them to do it without requirements, and the incentive system has worked well," Muller said. The Town

Septic System Initiative Keeps Alive Beach Town's Vision (continued)

has inspected more than 1,200 septic systems since 2000 and so far has seen a 14 percent failure rate. Many of these failures are the result of drainfields that malfunction and tanks that were constructed with cinder block and sand bottoms. The Town hopes to inspect all 3,000 septic systems within four years."We have found systems that have not been looked at in 25 years, and we go and inspect them, and they are fine because they were treated by year-round property owners who knew what they were putting down the system. Then we've had systems go in and not even 12 months later they're finished and have got to be completely redone," Krafft said. "What is obvious here is that we don't have flush-and- forget systems. If you treat the system badly, you're going to know about it pretty quick."

Testing the Waters and Gathering Data

To test the effectiveness of the Septic Health Initiative, water throughout the Town is tested weekly for fecal coliform, ammonium, nitrates, and phosphorus. "We spend more than $100,000 a year on testing the area water," Krafft said. "We test ditches, canals, the sound side, the ocean side, and the outfalls. Right now, we have 38 different sites that we are testing." Other sites in Nags Head are also tested weekly by the North Carolina Department of Environment, Health, and Natural Resources, which began monitoring beaches along the North Carolina coast in 1997. All of the data gathered from the water testing and septic system inspections by the Town are compiled to make up the final part of the Initiative, which is the development of a Decentralized Wastewater Master Plan. This program is a long term strategy that will allow the continued use of onsite systems without harming the environment.

Importance of Getting the Word Out

Since the Town has no authority to enforce any of the programs that comprise the Septic Health Initiative, officials had to rely on education efforts to build support for the Initiative. The Town's efforts included direct mailings to residents, articles in the Town's quarterly newsletter, interviews on local radio and TV stations, newspaper ads, and public presentations. "We want folks to understand how we envision the role of onsite septic systems in our community. We think it's a key part in our strategy to keep our community relatively small, with low density, yet still have clean water, clean ocean, and clean sound around us because our economy is based on folks coming down here and going to the beach. If we lose that clean water, then we have nothing to sell," Muller said.

Results of the Program

Educating the vacationers with door hangers and literature in rental properties seems to be having some effect. "In the fall after the first summer the program was in full process, one of the real estate companies came to us and said they had 50 percent fewer septic problems in Nags Head than they did the previous year," Muller said. Many residents are taking advantage of the free inspection and having their septic tanks pumped and repaired. "We get very good customer/ citizen support from it. It is one of the few programs that the government can run that makes our citizens happy," Bortz said, laughing. "They all speak very favorably of it. I don't think we've had any negative comments about the program. We are helping them financially to get their systems pumped, and at the same time, it's helping the Town, and it's helping the environment. So it's really a win-win situation."

[For more information on the Septic Health Initiative contact Todd Krafft, Town of Nags Head, P.O. Box 99, Nags Head, NC 27959. Phone: 252-449-6047; e-mail: krafft@townofnagshead.net; Web: www.townofnagshead.net. This article was modified and updated with permission from the Winter 2003 issue of Small Flows Quarterly, published by the National Small Flows Clearinghouse, West Virginia University/NRCCE, P.O. Box 6064, Morgantown, WV 26506-6064. Web: www.nesc.wvu.edu/nsfc]

Adopt-a-Pond: From Barren to Beautiful

A great blue heron lifts into the air as spectators approach, but dozens of butterflies continue to flit from one brilliant purple pickerel weed bloom to another. Native cannas and blue flag iris line the edges of the sloping bank, and pennywort grows over shallow waters to provide shade for fish. Wildlife watchers in this part of Florida's Tampa Bay region report regular visits by rabbits, foxes, and bobcats that live in a forested area beyond the pond.

Adopt-a-Pond: From Barren to Beautiful (continued)

An idyllic setting in one of Tampa Bay's spectacular natural preserves? Not quite.

It's actually a stormwater pond in a suburban Tampa neighborhood, part of Hillsborough County's innovative Adopt-A-Pond program created to help residents transform barren ponds into beautiful native habitats. "We get residents involved in the program for the aesthetics and the fish, but the real issue is sustainability—improving water quality and habitat," says John McGee, an environmental scientist in Hillsborough County's stormwater management section.

Even as technology offers new options for stormwater treatment, Mother Nature is still the best choice for removing nutrients from runoff. Plants take up nutrients from fertilizers, animals, and auto emissions, minimizing their impact on critical estuarine habitats, such as seagrass beds.

Although many studies have documented the effectiveness of plants on stormwater, it's difficult to quantify results from the nearly 200 ponds that have been adopted across Hillsborough County, McGee said. "It's a challenge to get volunteers to comply with scientific protocol to document results from individual ponds, but we do know the techniques work. Studies show the improvements; it's just hard to hard to quantify results from individual ponds."

Stormwater pond provides aesthetic and natural benefits.

Stormwater Ponds Get a Makeover

Thousands of manmade ponds—too many to count—dot Hillsborough County, many built after stormwater regulations first took effect in the mid-1980s. The focus of those initial regulations was flood control, not water quality, and most ponds weren't maintained to optimum standards.

"People call the county when the pond turns green or cattails take over their view," McGee says. "County policy doesn't allow us to maintain ponds for aesthetics so there wasn't much we could do to help."

The Adopt-A-Pond program was created to work with residents to clean up privately owned ponds, taking advantage of their labor and getting buy-in from an entire neighborhood, he explains. "The county doesn't have the labor to maintain ponds, but the residents really get involved once they see how well it works."

Residents See the Difference

Lori Lucas, group representative for the Colonial Lakes Pond Lubbers, is the perfect example of how Adopt-A-Pond works. "When we moved in, we had so many eight-foot tall cattails we couldn't even see the water." The sump in her yard, designed to catch and filter stormwater from the neighborhood before it discharges into nearby Lake St. Charles, is now surrounded by lush native plantings including pickerel weed, blue flag iris, cannas, and duck potato. "We get tons of butterflies and dragonflies and even birds like a little blue heron that took up residence on a floating planter and a bald eagle in a nearby pine tree," she says.

Neighborhood residents pitch in to remove invasive plants from their stormwater pond."

The plantings have been so successful that Lucas is planning on thinning the pickerel weed and sharing it with neighbors—many of whom she met through the Adopt-A-Pond program. "We were so new to the community, it was the first time we'd ever gotten together as a neighborhood."

The success of the county-wide initiative has prompted nearby Pinellas County to start a pilot program. "First and foremost, it's about education," McGee said. "The county can't maintain the ponds as well as we'd like, but if we clean up the ponds and plant them, we get buy-in from residents and they make all the difference in the world."

[This article has been reprinted with permission from the Fall 2003 issue of the Tampa Bay Regional Planning Council's Bay Soundings newsletter (www.baysoundings.com/fall03). For more information contact the editor, Vicki Parsons, at 4000 Gateway Centre Blvd., Pinellas Park, FL 33782. Phone: 727-570-5151; e-mail: editor@baysoundings.com.]

Joining Hillsborough's Adopt-a-Pond Program

The Adopt-A-Pond program is open to homeowners and neighborhood associations who live on or near ponds with one or more drainage easements dedicated to Hillsborough County, Florida. Residents must create a group of at least four people from two households, complete an application, and agree to its stipulations.

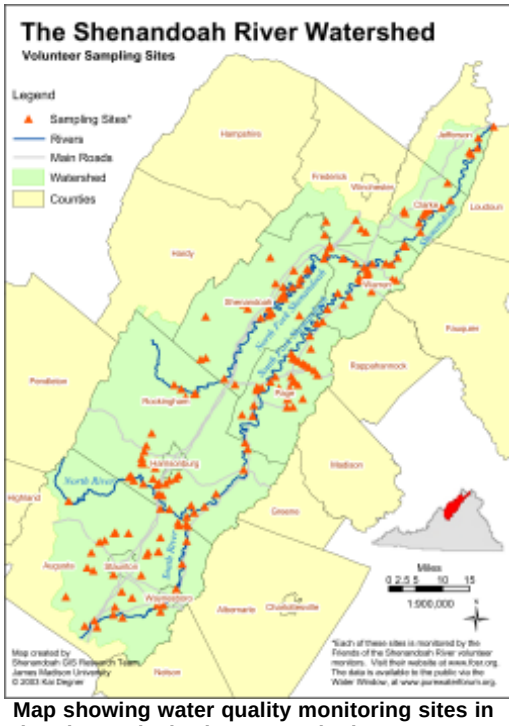
The county provides a free one-time cleanup of the pond to remove nonnative plants like cattails and water hyacinth, then helps residents plant native plants that enhance the aesthetic and environmental effectiveness of the pond. Each group may receive up to $600 in plantings initially. For large ponds, the county will help the group work with other organizations that provide grants for environmental projects.

Residents must agree to maintain the plantings with four workdays each year to remove nuisance plants and trash. They also must create safe zones around the pond where fertilizer and pesticides are not used, and mark all storm drains in the neighborhood so other residents know that what goes down the drain ends up in their pond.

Additionally, the county provides ongoing education for residents on topics ranging from how to minimize the use of fertilizer on lawns to identifying different bird calls and frog calls. Interested groups may request a "Pond Walk," where an environmental professional working as a volunteer for the program comes to visit the pond and discuss existing problems and options with residents. For more information, contact Martin Montalvo with Hillsborough County at 813-307-1787 or MontalvoM@hillsboroughcounty.org.

Interactive Maps Give Citizen Monitors New Look at Data

Water quality data collected by volunteer monitors play a key role in assessing the health of waters and driving local restoration projects. Timely feedback about data results is an important motivator to keep the volunteers interested and involved. In today's high-tech age, what better way is there to inform volunteers than via the Internet? One large volunteer monitoring group in Virginia's Shenandoah River watershed collaborated with other nonprofit groups and a large university to create a powerful interactive mapping and data sharing tool. Now, volunteer monitors, local officials, and interested citizens can go on-line to see the degree to which their local stream segments are impacted by pollution such as elevated nutrients and sediment from point and nonpoint sources. A similar resource is also available for citizen- and state-collected data in Minnesota.



Map showing water quality monitoring sites in the Shenandoah River watershed. Users can download data for each monitoring site within the Water Window.

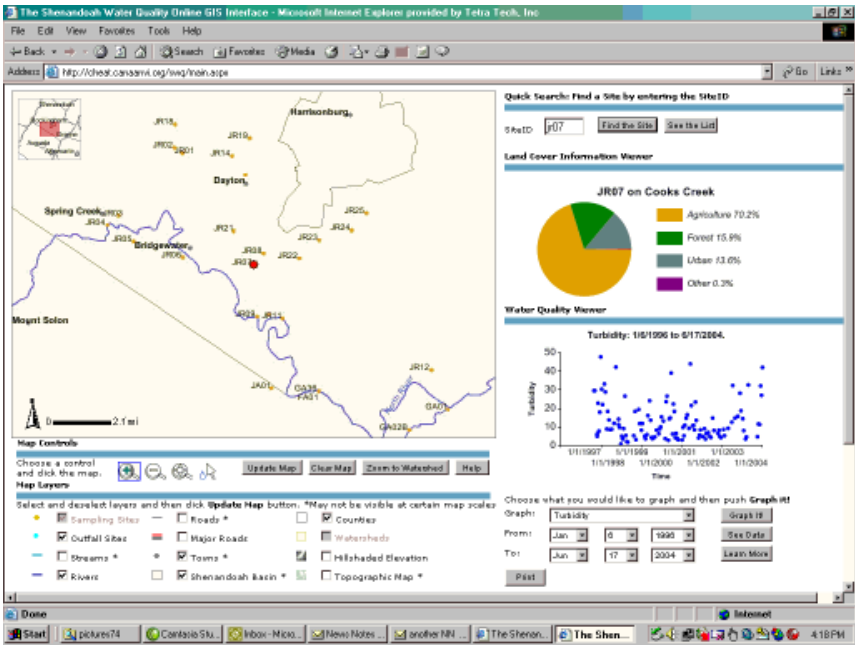
Water Window Sheds Light on Data

The Shenandoah Water Window (www.purewaterforum.org/waterwindow) allows Web users to look at maps of northwest Virginia's 3,000 square mile Shenandoah River watershed, locate volunteer monitoring sites, and graph, view, and download data for six common measures of water quality—dissolved oxygen, pH, turbidity, ammonia, nitrate, and phosphate. In addition to providing water quality data, the geographic information system (GIS) enables Water Window users to create maps of streams, roads, county lines, locations of municipal and industrial outfall sites, and other important features of their watershed of interest. Funding for development and maintenance of the Water Window is provided by the Canaan Valley Institute, in cooperation with James Madison University (JMU) and the nonprofit Shenandoah Valley Pure Water Forum.

The water quality data for the Water Window comes entirely from river water samples sent by volunteer monitors to the Friends of the Shenandoah River (www.fosr.org) laboratory for analysis. Monitors collect samples approximately two times each month. Currently, the database contains nearly 20,000 water quality data records from 183 monitoring sites for the period between 1996 and 2003. Beginning in Fall 2004, JMU students will update water quality data monthly on the Water Window.

"Shenandoah watershed stakeholders have been waiting for a tool like this for years," explained Thomas Benzing, JMU professor and project collaborator.

"Looking at a spreadsheet of numbers doesn't help the average citizen. We needed a way to make the data more accessible and meaningful to our volunteers. The added benefit of this system is that local government officials, planning personnel, and others can also visualize the data, and can identify problem areas in their communities."



A search on monitoring site number JR07 in Rockingham County reveals a locator map, a chart showing subwatershed land cover information, and a graph of water quality data for turbidity. Other parameters are also available for this site.

Applying the Window in the Watershed

The mapping format makes the Water Window ideal for educating children and adults alike, notes Benzing. "A local soil and water conservation district has incorporated the Web site into the educational program it takes into schools. Teachers are using the Web site to help their science students develop and use their research skills. Watershed groups in the Shenandoah Valley plan to use the data to help coordinate where they will implement restoration projects." As the Water Window becomes more well-known throughout the region, Benzing looks forward to using it for watershed planning and management.

The first opportunity to apply this tool to a major local planning process began this fall. Augusta County, located at the headwaters of the Shenandoah River, is updating its comprehensive plan. The county's Board of Supervisors has agreed to allow a student intern from JMU to work with the county to overlay the comprehensive plan maps with data from the Water Window. The project's goal is to inform the planning process with water quality data that has been collected by their constituents. "Years of monitoring by dedicated volunteers is truly paying off. For the monitors in Augusta County, having their data influence long-term planning is a dream come true," notes Benzing. "We hope that this first foray will serve as a case study that can be extended to other localities throughout the watershed."

One-Stop Shopping for Data in Minnesota

The Shenandoah Valley isn't the only place with volunteer monitoring data available from interactive maps. In 2003 the state of Minnesota launched its Environmental Data Access Web site (www.pca.state.mn.us/data/eda). The site, developed by the Minnesota Pollution Control Agency (MPCA), currently houses surface water data from across Minnesota collected by thirteen local, state, and federal agencies, and includes data collected by citizens participating in the state-sponsored Citizen Lake and Stream Monitoring Programs (www.pca.state.mn.us/water/clmp.html and www.pca.state.mn.us/water/csmp.html, respectively). By coordinating a state-sponsored citizen monitoring program, the MPCA is able to combine the knowledge and commitment of interested citizens with the technical expertise and resources of the MPCA staff to develop a more comprehensive statewide network for monitoring. The MPCA determines the type of data collected by the citizens, thereby ensuring the data are consistent with that collected by state staff. "The citizen data is extremely valuable for helping us to identify problem areas and water quality trends," explains MPCA's John Seaberg.

Data include water chemistry data, biological monitoring data, and summaries of discharge monitoring reports from facilities that hold MPCA water quality permits. By clicking on monitoring locations displayed on a statewide map that facilitates zooming in and panning around, users can find detailed information about monitoring stations and access data summaries and downloads for each. "Each monitoring station page informs the user of the source of the data they are accessing," notes Seaberg. Users can also discover whether their streams of interest meet designated uses by viewing maps depicting the Clean Water Act 303(d) listings and 305(b) assessments.

Interactive Maps Give Citizen Monitors New Look at Data (continued)

During Fall 2004 MPCA plans to add air quality data and information to the site, followed shortly by ground water data.

[For more information about the MPCA's Environmental Data Access tool, contact John Seaberg, Minnesota Pollution Control Agency, 520 Lafayette Road, St. Paul, MN 55155-4194. Phone: 651-296-0550; e-mail: john.seaberg@pca.state.mn.us. For more information about the Shenandoah Water Window, contact Tom Benzing, James Madison University-ISAT, MSC 4102, Harrisonburg, VA 22807. Phone: 540-568-2794; e-mail: benzintr@jmu.edu.]

Interactive Mapping Resources on the Rise

Sound environmental management decisions depend on information that is accessible, understandable, thorough, and up-to-date. To meet this need, local, state, and federal organizations across the country are increasingly relying on Web-based databases and mapping tools to collect and share their water resources and environmental data with decision-makers and the public. The following list is just a sample of those available across the country:

U.S. EPA's EnviroMapper for Water (www.epa.gov/waters/enviromapper). This interactive tool allows viewing and mapping of data such as (1) the uses assigned to local waters by each state (fishing, swimming, etc.), (2) waters that are impaired and do not support their assigned uses, (3) the reasons why waters are impaired, (4) water quality monitoring information, (5) closures of swimming beaches, and (6) the location of dischargers. The tool features several new layers of water data including EPA's national water quality database STORET, National Estuary Program study areas, and the location of nonpoint source projects funded by Section 319 grants.

Montana Natural Resources Information System Interactive Mapping Resources (http://nris.state.mt.us/interactive.html). These mapping tools allow users to explore information about Montana's counties, streams, towns, and watersheds, as well as information about fisheries, TMDLs, water rights, Army Corps of Engineer permits, and water quality monitoring sites.

Virginia Department of Environmental Quality (VDEQ) Environmental Mapping System (http://gisweb.deq.state.va.us). DEQ developed this resource to allow users to view the locations of pollution releases (permitted or accidental), as well as locations of impaired waters, by watershed or county.

Iowa Watershed Atlas Interactive Mapping (http://igsims.igsb.uiowa.edu/website/Watershed_Atlas). The Iowa Department of Natural Resources developed this tool to share watershed information such as soil loss, percent slope, highly erodible land, land cover, manure management sites, and locations of impaired streams. The Atlas allows users to access water quality data summaries by spatially linking to the Iowa Lakes database.

French Broad River Watershed Mapping (http://seris.info/RiverLink/maps.shtml). The nonprofit organization RiverLink developed a series of interactive digital maps to teach people about the French Broad River, which flows through North Carolina and Tennessee. The maps show the location of streams, stream health, toxic sites, water regulations, locations of parks, and sites for boat launches.

Interactive Mapping Resources from EPA's Chesapeake Bay Program Office (http://www.chesapeakebay.net/maps.htm). The Chesapeake Program offers several interactive mapping tools that allow users to see water quality status and trends, view modeling data, inquire about oil spill cleanup and response, and create watershed maps showing submerged aquatic vegetation, nutrient point sources, historic oyster reefs, predicted nutrient pollution, and more.

News in Agriculture

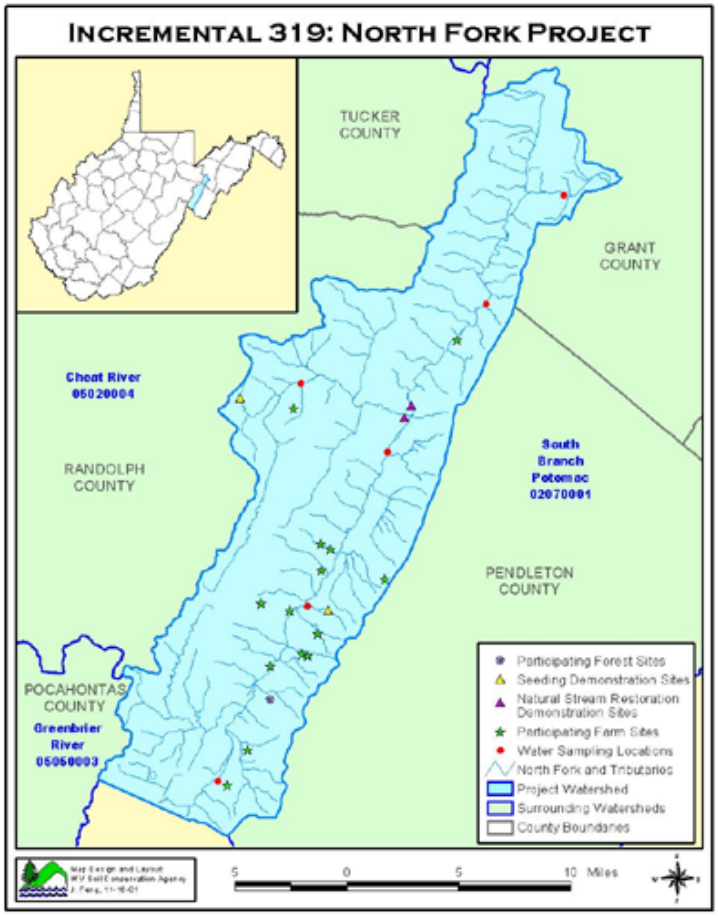
Success in the Headwaters of the Potomac

Will landowners in the North Fork of the South Branch of the Potomac River in West Virginia please stand up and take a bow?

When fecal coliform bacteria counts in the North Fork spiked to twice the allowable rates in West Virginia during the mid-1990s, landowners began working closely with environmental organizations, universities, and government agencies to improve water quality. Because of this successful partnership and the cooperation of most landowners, the stream no longer exceeds the criteria that would place it on the list of impaired or polluted surface waters in West Virginia (WV).

The North Fork of the South Branch of the Potomac River is a scenic, high-quality trout stream stretching for 46 miles in long, narrow valleys between steep, predominantly-forested ridges. The North Fork drains an area of approximately 200,000 acres where poultry and concentrated livestock feeding operations cling to floodplains. Historically, the region has produced beef cattle,

forages, timber, and some corn and apples. However, between 1993 and 1996 alone, the amount of poultry raised in the watershed doubled. Because so little land is appropriate for nutrient application, much of the litter and manure was improperly stored, managed, and utilized. In 1994 and 1995, the U.S. Geological Survey conducted a surface water quality survey that resulted in the placement of the South Branch, along with the North Fork and other Potomac tributaries, on the 303(d) list of impaired waters.



Project location and BMP map.

Working on the Problem

In 1998, the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) began working with the North Fork Watershed Association, a local citizen's group that was concerned about a separate issue: recurring flooding. NRCS worked with the group to develop a watershed plan to address their concerns. The plan did not identify any economically feasible major flood control solutions; however, it did identify flood mitigating measures and solutions relative to water quality improvement and protection. This plan was not initially funded, but soon came to the attention of the State as a potential project for funding under U.S. EPA (EPA) Section 319 Clean Water Act funds. The NRCS/North Fork Watershed Association plan was modified to focus more on water quality and subsequently funded with Section 319 funds through WV Department of Environmental Protection (WVDEP) and EPA as a project to complement other USDA-supported activities in the watershed.

Using various USDA and EPA funds and grants, State Revolving Funds, and other local money, the North Fork Watershed Association focused its conservation efforts on nutrient and animal waste management practices. A centerpiece of these efforts was the installation of structural controls for managing beef manure, poultry litter, and dead bird disposal. To date, a total of $992,000 has been granted to 15 individual on-farm agricultural EPA Section 319 projects. In addition, nearly $550,000 in USDA Watershed Systems funding (PL-534) has been used in the watershed. These grants were leveraged by additional funding from state organizations, as well as the West Virginia Legislature, which provided 10 percent of the cost share for each farm project.

The partners worked closely with farmers throughout the watershed to establish a wide range of on-farm best management practices (BMPs) to control runoff from feedlots and eliminate or reduce cattle access to the streams. BMPs include fencing along streambanks, establishing riparian buffers, providing alternative water sources, relocating and covering feedlots, constructing dead bird/animal waste composting and animal waste storage facilities, establishing rotational grazing, and other practices.

Farmers established nutrient management plans and learned how to better manage and store their animal waste. In 1994 the USDA helped to establish a nutrient management laboratory in the North Fork watershed that continues to play a key role in helping agricultural producers adopt and implement nutrient management planning. This lab, using a combination of state and federal funds, provides free analyses of manure and poultry litter for farmers within the watershed. Farmers drop off a sample of the manure in question, and receive an analysis report in a mail. The farmers and the technical staff at the local conservation district and at NRCS use the information to more accurately prepare site-specific nutrient management plans and to market the litter as fertilizer based on its nutritive value.

Success in the Headwaters of the Potomac (continued)

Because the watershed lacks much area suitable for spreading animal waste, the partners emphasized poultry litter sales and transfer to other areas when possible. Project partners held educational meetings to promote the use of poultry litter for fertilizer throughout the region. To improve the market link between litter producers and potential users of litter, several partners established a toll-free Potomac poultry litter marketing hotline in 1996. The partners initiated a pilot poultry litter transfer program that identified poultry producers with excess litter, as well as those farms in the region that could utilize the litter as a fertilizer. Typically those requesting litter will pay a small fee, plus all hauling costs. Although no North Fork watershed farmer will get rich selling litter, he or she may realize a small profit by participating in the litter exchange program. The result of these many efforts has been the export of significant amounts of litter out of the watershed.

Environmental agencies and organizations have also implemented a number of BMPs. The WV Division of Highways incorporated a variety of BMPs, including using poultry litter as fertilizer in roadbank seeding and constructing a "roadkill" composting facility to remove deer carcasses from along the roadways. (See "West Virginia Buries its Roadkill Problem" in the sidebar.) Using Section 319 funds through the WVDEP, the WV Soil Conservation Agency worked with Trout Unlimited, U.S. Fish and Wildlife Service, and the local conservation district on a stream channel restoration effort near Seneca Rocks on the mainstem of the North Fork. The project was designed by Trout Unlimited and uses natural stream channel design technologies (such as planting vegetation) to control erosion, reduce sedimentation, and re-establish riparian and aquatic habitat.

West Virginia Buries its Roadkill Problem

Many roads across the U.S. cut across highly populated wildlife habitat and create hazards for this wildlife, and this is especially true in West Virginia, a state that bills itself as "Wild and Wonderful." Roadkill (and deer in particular) along West Virginia highways is a significant problem. During a typical year, more than 16,000 deer are killed when struck by vehicles. The majority of these collision-related deaths occur during the deer mating season (late October and November). Decaying deer carcasses present an obvious health danger to humans and the environment if left out in the open. To remove this threat, the WV Division of Highways (DOH) operates 12 roadkill composting facilities across the state. Begun in 1998, the composting program successfully converts the deer carcasses into rich, nutrient-filled compost that is applied on the wildflower beds seen along highways throughout the state.

A typical composting facility in West Virginia consists of a series of six bays specially constructed to allow air to circulate during composting cycles. Each bay measures nine feet long by 10 feet wide.

Almost all the work performed at the composting facility is done with a front end loader. First, the bottom of each bay is layered with approximately 12 inches of sawdust, supplied by a local sawmill. Then DOH staff adds approximately four inches of chicken litter, shipped in from poultry barns in the state's eastern panhandle, including those in the North Fork of the South Branch of the Potomac River watershed. On top of the chicken litter, DOH staff places a layer of six deer carcasses, leaving a 12-inch space between the carcasses and the walls to discourage problems with flies and animals. Additional chicken litter is added to completely cover the carcasses. The steps are repeated twice more, resulting in three layers of this combination. Having multiple composting bays increases capacity and allows the timing of compost cycling to be staggered, which provides the freedom to accommodate deer carcasses throughout the year.

Once the layering is complete, DOH staff begins monitoring the temperature of each pile. Typically, over the first 40 days, the temperature of each pile will rise to approximately 120 to 130 degrees, level off, and then begin to drop. When the temperature begins to drop, DOH staff attaches a set of mixing forks to a front end loader and stirs the piles. The staff also adds 50 gallons of water while stirring. The staff then begins monitoring temperatures again. Over the following 30 to 40 days, the temperatures can climb as high as 150 degrees or hotter— enough to break down even the bones of the carcasses. When the temperatures begin to fall again, the compost is ready for use as a nutrient-rich soil amendment. In a typical year a facility completes two composting cycles and consumes 16 to 20 tons of sawdust and 15 to 17 tons of chicken litter.

Composting carcasses is an environmentally-friendly way of dealing with a health hazard, according to Gary Dyer, supervisor of the composting facility in West Virginia's District 4, along Interstate 79. His facility, built in 2001 at a cost of $10,000, spends $800 per year for chicken litter ($400 each for the litter and delivery) and $150 per year for sawdust. Prior to composting, his staff had to go out of their way to haul the carcasses to the dump, notes Dyer. "These facilities give us a convenient place to put our roadkill. Plus, on the other end of this process, we get a product we can use in our Operation Wildflower program."

For more information, contact Gary Dyer, WV Department of Transportation, Division of Highways, at 304-627-2411 or by e-mail at gdyer@dot.state.wv.us.

Success in the Headwaters of the Potomac (continued)

Cooperative Efforts Pay Off

As of 2001, more than 85 percent of the producers in the watershed had implemented BMPs. EPA's Tom Iivari, a North Fork project collaborator, points to a number of factors contributing to the high participation rate: multi-source funding, extensive outreach efforts by local organizations, and numerous demonstration projects and field days (educational events). The large amount of financial and technical assistance available "enabled the farmers to learn about the best management practices and helped them to integrate the practices into their operations," he explained. The producers are now better managing the 4,100 tons of poultry litter and 1,600 tons of beef manure generated in the watershed each year, making it no longer subject to runoff in the waters of the North Fork. In most areas, producers have implemented BMPs such as stream fencing and alternative water sources that prevent cattle from directly accessing streams. Recent monitoring of fecal coliform levels in the river and tributaries confirms that there is no longer any significant bacteria contamination from poultry and livestock. Based on these results and the extent of BMPs installed, EPA approved an updated 303(d) list of West Virginia's impaired and threatened waters in June 2003 that no longer includes the North Fork.

Example of a concentrated animal feeding area prior to BMP installation.

Animal feeding area after installation of waste storage facility, runoff control system, stream fencing, clean water diversion, paved feeding area, livestock watering facility, stabilized access road, and critical area planting.

The success of the North Fork project motivated the state of West Virginia to sign on to the Chesapeake Bay Agreement in 2000, joining five other states and the District of Columbia in a partnership to reduce nutrient and sediment loading to the Bay. The ultimate goal is to remove the Bay and its tidal rivers from the lists of impaired waters. With the success of the North Fork watershed project, West Virginia has demonstrated that a voluntary, incentive-based program is a viable approach to cleaning up an impaired watershed and achieving water quality standards. The project also shows that the long-term involvement of key stakeholders can foster local cooperation and enthusiasm for water quality improvement. For more project information, see www.epa.gov/reg3wapd/nps/successstories/WVpdf/FINAL_NF_SINGLE.pdf.

[For more information, contact Tom Iivari, Watershed Planning Specialist, U.S. Environmental Protection Agency, 1650 Arch Street, Philadelphia, Pennsylvania 19103. Phone: 215-814-2319; e-mail: iivari.tom@epa.gov)]

Conservation Easement Preserves Happy Farm

Thanks to a fortunate set of circumstances and a lot of work, southern Maine's "Happy Farm" will remain in the family not only as a working farm but also as an educational demonstration project for nonpoint source pollution control efforts. Happy Farm's transition began when it was put up for sale after the original owner passed away. The owner's wife was unable to maintain it and none of their five children were involved in farming. The owner's nephew and wife, Robin and Pat Chase, wanted the farm, but could not afford to buy it on their own. As a result of a confluence of factors, including the farm's location and a resident endangered species, Happy Farm will continue as a working farm, stay in the family, and protect the environment.

A cheerful sign greets visitors to the farm.

Soon after the federal government listed Atlantic salmon as an endangered species, the Sheepscot Valley Conservation Association (SVCA) embarked on its Atlantic salmon protection program. More importantly, the U.S. Fish and Wildlife Service had identified the river adjacent to the Happy Farm as prime salmon spawning and nursery habitat and a priority for protection. The farm was in one of the SVCA's focus areas and therefore high on the list for protection.

The National Fish and Wildlife Foundation's Maine Atlantic Salmon Program purchased development rights under a conservation easement to be held by the SVCA on the 64-acre property. The easement specifies that the Happy Farm will remain a working farm and that the salmon habitat will be protected with a 200-foot buffer along the entire 2,200 feet of the property's Sheepscot River frontage. In addition, the

Conservation Easement Preserves Happy Farm (continued)

new owners, the Chases, received assistance for the acquisition from the Maine Department of Agriculture's Farms for the Future program, administered by Coastal Enterprises, Inc., which helped them create a business plan for their farming operations.

Volunteers pitch in to restore a riparian buffer along the Sheepscot River.

In May 2003, 25 volunteers converged on Happy Farm, planting 200 trees to complete a 200-foot buffer on the Sheepscot River. Aided by the SVCA's AmeriCorps volunteer, Stacy Cibula, who coordinated and directed the planting, volunteers from the SVCA participated in the first event of the Educational Demonstration Project that is to become a learning center for nearby Whitefield Elementary School.

At the closing for this sale, the family expressed delight that the conservation easement will protect the farm in perpetuity, and the Chases indicated their interest in operating the farm as an educational demonstration project. The SVCA's Executive Director, Maureen Hoffman, said that this project "exemplified the type of win-win situation we love to see happen in our watershed. The river is protected from pollution and development and at the same time, we can bring our schoolchildren to a real working farm owned by a local family."

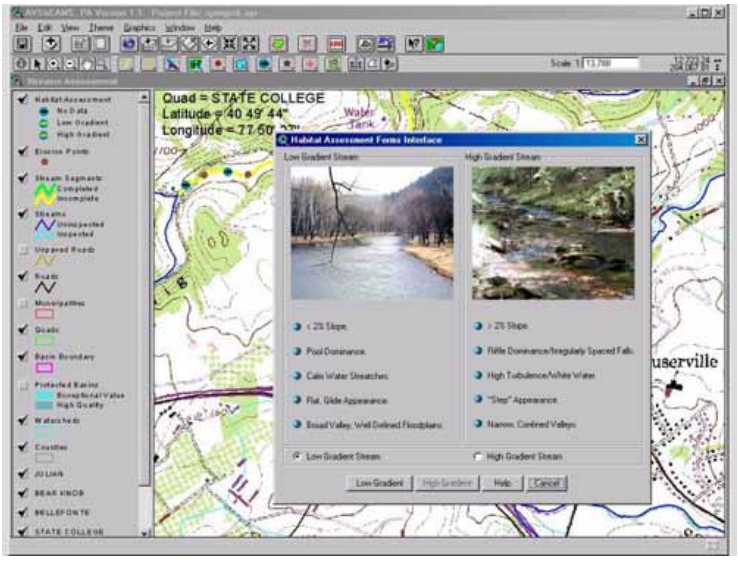
[Article taken and modified from the Winter 2002/2003 issue of Nonpoint Source Times, a publication of the Department of Environmental Protection of the State of Maine. For more information, contact Maureen Hoffman at Sheepscot Valley Conservation Association, 624 Sheepscot Road, Newcastle, Maine 04553. Phone: 207-586-5616; e-mail: maureen@sheepscot.org.]

Software Spotlight

AVStreams: Moving Stream Monitoring Data into GIS

Whether you are simply looking for a handy way to electronically store and retrieve reams of stream monitoring data or want to take advantage of the visual and data analysis firepower of GIS, an innovative GIS module called AVStreams may offer a solution.

A typical drawback of managing stream or riparian characterization data is that it is place-based information that often stays on paper forms, where written descriptions and time series data have to be viewed in conjunction with paper maps to put the information in context. AVStreams circumvents this problem by allowing users to associate detailed stream/riparian data with geographic points (such as stream monitoring stations) along stream segments.



AVStreams' Habitat Assessment Forms interface.

Using GIS to Link Descriptive Data

In this application, stream segment data is pulled up against a background of GIS information such as watershed boundaries, roads, topographic maps, aerial photos, and municipal boundaries, to create location context, and assist in basic site characterization. Users can add their own data along selected stream segments. To enrich the description of the stream segments, data can be added to describe riparian and aquatic habitats, agricultural BMPs, water chemistry, and wetlands, along with miscellaneous field notes. Digital orthophotos can be displayed as background images. AVStreams is a GIS extension for use with ArcView 3.2 or 3.3, and is not yet available for later versions such as ArcView 8.X or 9.X.

AVStreams: Moving Stream Monitoring Data into GIS (continued)

Stream characterization data is input via simple dialog boxes that are custom-designed to meet the requirements of a variety of stream/habitat assessment forms in common practice around the country. (See the box for a full list of forms that AVStreams supports). Although primarily useful as an electronic data warehouse for a stream project, AVStreams offers a limited suite of tools that are useful in stream data analyses, such as area/distance calculation and estimation of streambank erosion at a point. Reporting tools include a map layout generation and a report writer that generates an HTML page of stream characterization information based on entered data. Future versions of AVStreams will accommodate "Rosgen-type" stream morphology classifications and incorporate other features.

Modify it to Fit Your Watershed

A limitation of the application is that the dataset is currently limited to Pennsylvania, with such unique layers as Pennsylvania's State Water Plan boundaries, aerial orthophotos of Pennsylvania counties, map projections best suited to Pennsylvania, and Pennsylvania's "Smallsheds" watersheds data. The application was originally developed with Pennsylvania Department of Environmental Protection funds to support its watershed characterization work. However, the developers of this software, based in The Pennsylvania State University's (Penn State) Institutes of the Environment, emphasize that the application's core programming is such that if the geographic data are available, it can be easily adapted for other parts of the country. Penn State's Dr. Barry Evans, who spearheaded the project, says, "The data requirements are frequently used geographic data, often in the public domain, and the program can also accommodate unique state data."

Since 2001, Pennsylvania conservation district planners and other watershed practitioners who gather and use stream-related data have been using AVStreams. Terra Dillman, Watershed Specialist at the Tioga County Conservation District says she regularly uses the erosion estimation tool and the riparian tool. She frequently works with watershed groups who have contacted DEP because they are concerned about streams in their area. DEP refers them to her office, and she helps them by writing grants and developing baseline stream or riparian assessments—the first step toward restoration plans and implementation. Dillman notes, "AVStreams works well for my purposes by helping me establish the macro-scale picture of where the problems are located along a stream."

AVSTREAMS Offers Widespread Application

AVStreams can be applied to a variety of forms and methodologies used in stream analysis and assessment, and supports the stream/habitat assessment forms listed below. *The reference section of the application includes all the source documents for the forms.*

- USDA Stream Visual Assessment Protocol (from the Natural Resources Conservation Service (NRCS) Tech Note 99-1)
- Streambank Erosion Inventory Form (NRCS Field Office Technical Guide)
- Riverkeeper Riparian Stream Visual Characteristic Assessment
- US Army Corps of Engineers Wetland Restoration and Creation Opportunity forms and Wetland Tracking and Information Documents
- Stream stabilization and restoration forms developed by Penn State's Dr. Peggy Johnson.
- Upper Susquehanna Coalition (Streambank Assessment and Agricultural Best Management Practices Implementation Assessment Forms)
- NRCS Stream Visual Assessment Protocol
- Stream Reconnaissance Handbooks (Streambank and Floodplain Vegetation Description Field Form, Region and Valley Description, Streambank Survey, and Channel Transition)
- Rapid Assessment Method—Developed by Penn State's Dr. Peggy Johnson (Stream Channel Stability Assessment in Vicinity of Road Crossing)
- Center for Dirt and Gravel Road Studies/Penn State (Unpaved Road Evaluation)
- NRCS Erosion Prediction Worksheet
- US EPA Rapid Bio-Assessment Protocols (Habitat Assessment and Fish Sampling)
- PA DEP & The Environmental Alliance for Senior Involvement Corps (Biosurvey Assessment and Water Monitoring Field Data Sheet)
- Riparian Assessment—Melissa Schnier/Penn State (Riparian Area Assessment Data Sheet)

AVStreams: Moving Stream Monitoring Data into GIS (continued)

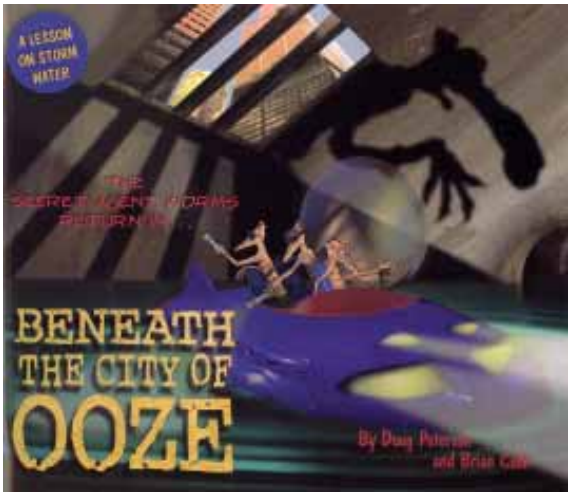
Ms. Dillman finds AVStreams particularly useful for (1) generating maps that help communicate with volunteer watershed group members who have minimal background in stream dynamics and a watershed approach, (2) developing priorities and recommendations for restoration on a Stream Reach-specific basis as opposed to vague macro-level recommendations, and (3) cataloging field-collected data in a useable manner.

[For more information, contact Dr. Barry M. Evans, Penn State Institutes of the Environment, The Pennsylvania State University, 128 Land and Water Research Building, University Park, PA 16802. Phone: 814-865-3357; e-mail: bme1@psu.edu; Web: www.avstreams.psu.edu.]

Notes on Education

Secret Agent Worms Teach Kids About Stormwater Runoff

There are worms in our sewers and they're trying to save Sparkle Lake from the ravages of stormwater runoff pollution.



Move over James Bond and Austin Powers! Here come the Secret Agent Worms. In a brand new book geared for upper elementary school kids and produced by the University of Illinois (U of I) Extension office, the Secret Agent Worms are on a mission. They're exploring the movement of polluted runoff into and through their city's storm sewer, and into their beloved Sparkle Lake in the new book, *Beneath the City of Ooze.* The story line is a fast-paced take-off of spy stories such as James Bond and Mission Impossible.

This glossy, full-color, 36-page comic book tale takes readers into the storm sewers to subtly teach how sewers work and how they can carry pollutants and degrade our lakes, rivers, and wetlands. In the story, Secret Agent Worms Napoleon Soil (Agent 001) and Jane Blonde (Agent 009) are trying to find out why Sparkle Lake is becoming polluted. Their only clue: It has something to do with storm sewers.

Napoleon and Jane work for the top-secret organization known as E.A.R.T.H. , or Espionage Agents with Really Terrific Hair. (These worms have hair.) "But unfortunately, they are not the brightest worms on the planet," said Doug Peterson, author of the new book.

Napoleon and Jane are convinced that evil agents from M.U.D. (Mean and Unfriendly Doofuses) are polluting the lake using an army of robots hidden in the sewers. So they go off in search of the robots, along with their much wiser grandfather. "The grandfather is the voice of reason," Peterson explained. "It's through the grandfather that readers learn about the link between storm sewers and contamination of lakes and rivers."

Beneath the City of Ooze is written at a fourth-grade reading level and was funded by the Illinois EPA through Section 319 of the Clean Water Act. It is the follow-up to the award-winning book, *The Disappearing Earth,* which dealt with the issue of soil erosion. "My 8-year-old daughter and her friends loved *The Disappearing Earth* and pronounced it 'way cool,'" noted Nancy Mesner, a water quality specialist from Utah State University.

Doug Peterson, who is also a regular writer for VeggieTales books, collaborated on both Secret Agent Worm books with illustrator Brian Cook. "Brian illustrated *Beneath the City of Ooze* in comic-book style and has come up with visually stunning pages," Peterson said. "He has combined the cartoon worms with real-world elements, including photographs taken on the streets of Chicago."

Like the first book in the Secret Agent Worm series, *Beneath the City of Ooze* is supplemented by a teacher's packet and science kit.

Individual copies of *Beneath the City of Ooze* cost $7 each, with a discount for sets of 10. The Storm Water Teacher's Packet, which sells for $40, includes a copy of the book, plus a full-color poster, 40 temporary tattoos, 40 Secret Agent Worm membership cards, six activity sheets and a

Secret Agent Worms Teach Kids About Stromwater Runoff (continued)

Mission Possible II Teacher's Guide. The teacher's guide explains how to conduct four different storm water experiments and provides other activity ideas. An accompanying science kit, available for $210, includes the teacher's packet plus all the supplies necessary to create a tabletop City of Ooze, which can be used to demonstrate how storm sewers work.

To order copies, call the toll-free number 800-345-6087. You can also order Secret Agent Worm books on-line by visiting U of I Extension's Publications Plus Web site at www.publicationsplus.uiuc.edu.

[For more information, contact Doug Peterson, Information Technology and Communication Services: Extension Communications Specialist, 65 Mumford Hall, MC 710, 1301 W Gregory Drive, Urbana, IL 61801. Phone: 217-333-9444; e-mail: dgpeters@uiuc.edu.]

University-Level Nonpoint Source Curriculum Debuts

The Patrick Center for Environmental Research at the Academy of Natural Sciences of Philadelphia has developed a new Nonpoint Source (NPS) Pollution Assessment Techniques Course for graduate and senior-level undergraduate students. This field-based, hands-on course was developed in response to numerous faculty and student requests, and the observation that NPS pollution assessment techniques are not generally taught in an organized manner in university programs. The course covers a number of techniques for physical, chemical, and biological assessment of a watershed, and imparts practical skills of widespread utility for addressing NPS pollution. The course targets both students and professionals working in the environmental sciences.

Same Name, Different Aim

The University of Maryland (UMD) offers a course of the same name through its Biological Resources Engineering Program. UMD's Nonpoint Source Pollution Assessment course (ENBE 462), which has been offered for the past ten years, explores how principles of hydrology and fluid mechanics are used to identify, measure, and quantify nonpoint source water pollution. Course instructor Gary Felton explains, "Students learn about what makes water flow, how they can measure it, and, once they have collected data, what they can do with it." Students are required to apply their knowledge to a number of practical projects, such as the development of a water quality monitoring plan. They must also complete several assignments involving both informal and formal written communications. The course is designed to provide students with skills useful in the environmental professional field. For more information, visit www.agnr.umd.edu/users/Bioreng/felton/courses.html or contact Gary Felton, Assistant Professor, Biological Resources Engineering Department, University of Maryland, at 301-405-8039 or via e-mail at gfelton@umd.edu.

The scientists at the Academy believe that after taking this semester-long course, the students are able to (1) better interpret watershed assessment data for determining watershed conditions, (2) function more effectively as members of a watershed assessment team, and (3) appreciate why various types of assessments (physical, chemical, biological) are required to characterize NPS problems. The course was piloted to seven undergraduates and five graduate students in Spring 2003 at Drexel University in Philadelphia, and is expected to be taught there and elsewhere in the future.

The course development was funded through Pennsylvania Department of Environmental Protection's Coastal Nonpoint Pollution Program. The scientists compiled the course information into a report that is available for free download at www.acnatsci.org/research/pcer/currentprojects/nonpointsource.html. The report contains a course syllabus; outlines of lectures, laboratory and field exercises; study topics; and course final report and presentation. The scientists believe that their report is detailed enough to allow other multi-disciplinary groups of trained professionals to adapt it to a semester-long, hands-on, field-based course on techniques in NPS assessment elsewhere.

[For more information, contact Puneet Srivastava, Assistant Professor, Biosystems Engineering Department, 206 Tom E. Corley Building, Auburn University, Auburn, AL 36849-5417; Phone: 334-844-7426; e-mail: srivapu@auburn.edu. You may also contact Daniel Kreeger, Patrick Center for Environmental Research, Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19103; Phone: 215-299-1184; e-mail: kreeger@acnatsci.org.]

Museum Offers a View of the Hudson River

Visitors to The Junior Museum in Troy, New York, leave with a better appreciation for the Hudson River ecosystem. In early 2003 the not-for-profit children's museum opened a permanent exhibit that represents all 315 miles of the Hudson River. The impressive 75 foot-long exhibit, complete with flowing water and live animals, is made up of a series of aquatic tanks and terrestrial exhibits representing the different aquatic habitats found on the river. Museum educators offer detailed information about each type of habitat, including the impacts that various types of point and nonpoint source pollution can have on each. To accompany the Hudson River exhibit, the museum is currently developing a large interactive 3-D Hudson River watershed model to allow people to experiment with runoff and best management practices.

The Many Faces of the Hudson

The Hudson River exhibit focuses on five key locations and ecosystems found along the river, including the river source, an Adirondack stream, an estuary, a salt marsh, and a tide pool.

(1) River Source: Lake Tear of the Clouds. The Hudson River begins at Lake Tear of the Clouds alongside Mount Marcy, the highest peak in the Adirondack Mountains. The exhibit's "tear" pool is located on the face of a ten-foot tall rocky boulder, offering a dramatic visual element to each entering visitor. Although "Tear of the Clouds" is considered the source of the Hudson, the museum programs stress that most of the water actually comes from the many small streams and creeks that make up the Hudson River watershed.

(2) The waterfall from the tear pool flows into an Adirondack stream. This aquatic habitat is representative of feeder streams entering the Hudson River in the lower Adirondack Mountains. The water current simulates the smaller streams that are part of the watershed. This huge tank with its gravelly bottom and rocky background is filled with live chubs, darters, brook trout, bass, and crayfish.

(3) The Hudson transitions from stream to estuary at the City of Troy Dam (symbolically marked with a wooden signpost), located just north of Albany, New York. The estuary stretches more than 150 miles from Troy to the southern tip of Manhattan in New York City (this area in Manhattan is also know as the Battery for the battery of cannons that once stood here to protect the city). As visitors head further downstream in the exhibit, they begin to see the effects of the Atlantic Ocean. The water moves more slowly, allowing plants to grow on the bottom. The Hudson becomes a spawning ground for dozens of fresh and saltwater fish species. This habitat, a mix of salt water diluted by fresh water from tributaries and stormwater runoff, supports a wide array of plants and animals. The freshwater upper estuary tank contains fish typical of the side waters of the mid-Hudson (points south of the Troy Dam), including live pickerel, catfish, perch, crappie, and large-mouth bass.

Children get hands-on instruction at the tide pool.

(4) At the end of the estuary area, just north of the Battery in New York City, visitors reach the salt marsh. They learn that the salt marsh is saltier, shallower, and muddier than the estuary, and serves as a premier nursery habitat for ocean fish. The fish hatch farther up the river, then mature in the salt marsh before heading to the ocean. Visitors enjoy live Puffer fish, sea robins, striped bass, blue claw crabs, and more in the salt marsh tank.

(5) Visitors find the end of the Hudson River at the Tide Pool. This low tank shows the ocean as it meets the Hudson River at the Battery. Visitors gather along one side of the seawater-filled pool, where a museum educator shares fascinating facts about the live sea stars, horseshoe crabs, green and purple sea urchins, whelks, and mussels. In keeping with The Junior Museum's mission of "Hands-On

Museum Offers a View of the Hudson River (continued)

Learning" the educator offers even the youngest visitor the opportunity to gently touch these amazing creatures.

"Many visitors to our current exhibit are surprised to learn that the same types of fish they see in the tanks are actually living in the Hudson," explains Heidi Klinowski, History and Collections curator. "They've heard the water is dirty and just assume that the Hudson is too polluted to support fish. The museum educators emphasize that we can all help the river by keeping litter and other pollutants out of it."

Watch Runoff at Work

The museum is currently developing the Hudson River Valley Watershed exhibit to accompany its main Hudson River exhibit. Due to be completed in January 2005, this hands-on watershed exhibit will be similar to the Enviroscape® Watershed/Nonpoint Source model, but will be built on a much larger scale and will specifically demonstrate the Hudson River Valley. Tiffany Fleming, the museum's Hudson River educator, says the new exhibit will encourage visitors to engage in activities that help them discover how pollution from various sources can be prevented from entering the river.

When the watershed model is complete, visitors will be able to further understand the connections by performing hands-on experiments. For example, one interactive component of the exhibit will allow visitors to "make rain" in the form of colored water that can be sprayed on an area and traced as it flows toward the river. They will be able to remove miniature trees and shrubs and see how their removal increases erosion of sediment. Conversely, they'll see how wetlands, detention ponds, and buffer zones can successfully capture and remove this sediment from the runoff. Klinowski added, "We hope the watershed exhibit will help children and adults understand that their everyday actions can make a difference to the Hudson River."

Funding the Hudson Exhibit

The Hudson River Exhibit was funded by an $80,000 grant from the NY State Department of Environmental Conservation's (DEC) Hudson River Estuary Program. The grant also includes funding for a full-time Hudson River educator to develop and present programming for school groups and the general public. The museum received an additional $18,000 from the NY DEC, in cooperation with the NY State Thruway Authority and the Malcolm Pirnie Environmental Engineering Firm, to fund the 3-D watershed model exhibit.

[For more information, contact Heidi Klinowski, The Junior Museum, 250 Jordan Road, Troy, NY 12180. Phone: 518-235-2120 ext.223; e-mail: heidik@juniormuseum.org; Web: www.juniormuseum.org.]

Reviews and Announcements

Agricultural Drainage Series Expands

A publication from the University of Minnesota (U of M) Extension Service, "Agricultural Drainage: Issues and Answers," explores the environmental impacts of drainage on the hydrology of watersheds, water quality of the receiving water bodies, and the amount and quality of nearby wetlands. This is the latest publication in the U of M Extension Service's agricultural drainage publication series, and is available on the Internet at www.extension.umn.edu/distribution/cropsystems/DC7740.html. Earlier publications in the series discuss soil and water concepts, water quality, and how to create a drainage system. For a list of other publications, as well as additional resources about drainage, visit the U of M Extension Service's drainage Web site, "The Drainage Outlet," at http://d-outlet.coafes.umn.edu.

Best Management Practices for Road Construction and Maintenance

More and more resources are available to help road managers and developers incorporate environmental best management practices into their activities. Some of these are available through an EPA Web site designed to help the public find key educational and technical guides for preventing nonpoint source pollution from road and bridge construction and maintenance (www.epa.gov/nps/roadshwys.html). Examples include:

- *Low-Volume Roads Engineering Best Management Practices Field Guide*. A new U.S. Department of Agriculture Forest Service guidance manual is available to help road builders, road managers, and resource specialists in most geographic areas to build better, more cost-effective low-volume roads that minimize adverse environmental impacts and protect water quality. The manual discusses road-building issues, includes recommended best management practices, and lists practices to avoid. To view the document, see http://zietlow.com/manual/gk1/web.doc.
- *Road Maintenance Video Set*. This five-part video series was developed for U.S. Department of Agriculture Forest Service equipment operators, but offers educational value for a wide audience. It focuses on environmentally-sensitive ways of maintaining low volume roads. The videos include: (1) Forest Roads and the Environment, (2) Reading the Traveled Way, (3) Reading Beyond the Traveled Way, (4) Smoothing and Reshaping the Traveled Way, and (5) Maintaining the Ditch and Surface Cross Drains. For more details about video content and ordering information, please visit www.epa.gov/nps/maint_videoset.html.
- *Gravel Roads: Maintenance and Design Manual*. This manual was developed by South Dakota for the U.S. Federal Highway Administration to focus on the design and maintenance of gravel roads. The purpose of the manual is to provide clear and helpful information for doing a better job of maintaining gravel roads. The manual is designed for the benefit of elected officials, managers, and grader operators who are responsible for designing and maintaining gravel roads. To view the manual, see www.epa.gov/nps/gravelroads.
- *Best Management Practices for Environmental Issues Related to Highway and Street Maintenance*. Published in 1999 by The National Cooperative Highway Research Program (NCHRP), this document has just recently become available on the Web. The document is a compilation of practices likely to increase the environmental sensitivity of road maintenance work, and is written for state, county, city, and local agencies. A full-text electronic copy is available in the National Transportation Library digital collection. See www.epa.gov/nps/roadshwys.html for a link to the publication.

GAO Report Notes Need for Better Data Collection Coordination

In its June 2004 Report, *Watershed Management: Better Coordination of Data Collection Efforts Needed to Support Key Decisions*, the Government Accountability Office (GAO) explores a number of issues concerning the water data that various organizations collect and the degree to which their data collection efforts are coordinated with each other (available at www.gao.gov/new.items/d04382.pdf). The report noted that 16 key federal agencies collect water data, and while GAO found instances where good coordination has decreased water quality information gaps and duplication of effort, for the most part, entities collecting water quality data are either not coordinating their efforts or have experienced difficulty in doing so. The report explores the reasons for these difficulties and proposes solutions.

Great Lakes Stormwater Management Report Released

In July 2004, the non-profit organization American Rivers released a report titled *Catching the Rain: a Great Lakes Resource Guide for Natural Stormwater Management*. The report explores a variety of natural stormwater management approaches suitable for the Great Lakes region. The report is meant to serve as a foundation for education and research on alternative stormwater

management techniques, particularly for public works staff, developers, and citizens. This easy-to-read handbook provides basic information on use, space requirements, cold weather considerations, and costs. Additionally, it lists a variety of sources that can provide further information on technical requirements, design, supporting ordinances, and other information. The report is available for download at www.americanrivers.org/newreportonstormwatermanagement.html.

Guide Features Nonnative Invasive Plants of Southern Forests

This nonnative invasive plant identification field guide devotes two facing pages to each plant with several revealing full color photographs showing leaves, flowers, fruit, and bark during different months of the year. The guide describes the ecology of each plant and provides a brief history of origin and use, plus a map of states with suspected infestations. The guide discusses general principles for controlling nonnative invasive plants and prescribes suggested controls for specific nonnative invasive plants. The guide is available on the Web at www.srs.fs.usda.gov/pubs/gtr/gtr_srs062/. To request a free printed copy, call 828-257-4830, or e-mail pubrequest@srs.fs.usda.gov and ask for GTR-SRS-62. Copies can be requested by mail from Southern Research Station Publications, 200 W.T. Weaver Blvd., P.O. Box 2680, Asheville, NC 28802.

Report Outlines How Smart Growth Can Protect Water Resources

EPA recently released a report to help communities protect water resources and achieve "smart growth." The report lists 75 novel approaches that state and local governments and water quality professionals can use to achieve their smart growth and water quality goals. Some of these approaches include redeveloping abandoned properties, encouraging rooftop gardens, creating shared parking, and promoting tree planting. A free copy of *Protecting Water Resources With Smart Growth* is available by sending an e-mail to ncepimal@one.net or calling 800-490-9198 and requesting EPA publication 231-R-04-002. The report and more information about smart growth also are available at www.epa.gov/smartgrowth on the Web.

Report Indicates Easement Use on the Rise

A new study on agricultural easement programs finds that use of this land conservation tool is most prevalent in suburban and semi-rural parts of major metropolitan areas—counties with populations of more than 100,000 that have been experiencing rapid population growth for years. *A National View of Agricultural Easement Programs* is the most in-depth and comprehensive analysis of agricultural easement programs undertaken in the United States. This report, the first in a series to be issued from the study, profiles 46 agricultural easement programs in 15 states—nearly half of all publicly funded farmland protection programs in the nation. The 46 programs studied have spent a total of $1.8 billion to protect 887,000 acres on 5,800 farms. The study was done by American Farmland Trust and the Agricultural Issues Center, University of California, in collaboration with Farm Foundation. The document is available for download at www.aftresearch.org/PDRdatabase/NAPidx.htm.

Study Shows Clear-Cuts Increase Mercury in Runoff

A study by researchers in Finland and Sweden indicates that total and methyl mercury levels in runoff significantly increase when a forested watershed is clear-cut, plowed, and planted with new trees. The study found that the increase was likely due to greater soil saturation levels and corresponding increases in bacteria that methylate the mercury already present in the soil, along with increases in transport of organic matter (and the mercury that is bound to it) in runoff. The findings also suggest that these increased mercury levels in runoff can remain high for years. For more information, see the article published in the May 8, 2003 issue of Science News, available on-line at http://pubs.acs.org/subscribe/journals/esthag-w/2003/may/science/be_mercury.html.

Web Sites Worth a Bookmark

International Stormwater Best Management Practices (BMP) Database

www.bmpdatabase.org

This database provides access to BMP performance data in a standardized format for roughly 200 BMP studies conducted over the past fifteen years. The database may be searched and/or downloaded on-line, and is also available on CD-ROM.

Farmland Information Center

www.farmlandinfo.org

Agricultural landowners, agricultural professionals, and citizens concerned about the loss of agricultural land now have easier access to assistance, thanks to an expanded Farmland Information Center (FIC) Web site. The FIC, a partnership between American Farmland Trust and the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS), maintains an ever-growing collection of state laws, reports, and other literature relating to farm and ranch land protection and stewardship. It also offers an "answer service" to provide direct technical assistance via phone, e-mail, and fax.

NRCS Soil Quality Information Sheets

http://soils.usda.gov/sqi/soil_quality/what_is/sqiinfo.html

The USDA's NRCS offers a series of one-page color flyers that discuss soil quality and soil-related environmental concerns. The site includes fact sheets about soil erosion, soil compaction, soil biodiversity, and other soil quality resource issues, as well as fact sheets explaining how to evaluate soil quality and manage soil in pasturelands and rangelands.

Green Roof Information Network

www.greenroofs.com

Greenroofs.com is the international green roof industry's resource and on-line information portal. The group informs, promotes, and inspires the earth-friendly technology of organic green roof architecture by offering a network through which people exchange ideas, projects, news, travel, research, and marketing opportunities.

Source Water Protection Efforts—Agency Index

www.epa.gov/ogwdw/protect/feddata/agency.html

This Federal Agency Data Index provides access to information relevant to source water assessment and protection efforts from the U.S. Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Interior, and Transportation, as well as from the Environmental Protection Agency, Federal Emergency Management Agency, Tennessee Valley Authority, and the U.S. Postal Service.

Calendar

November 2004

14-18 *AWWA Water Quality Technology Conference and Exposition*, San Antonio, TX. For more information, see www.awwa.org/conferences/wqtc.

15-19	*10th Biennial Watershed Management Council Conference—Watershed Management on the Edge: Scarcity, Quality & Distribution*. San Diego, CA. For more information, see www.watershed.org/wmc.
16-19	*Transboundary Waters Management*, Tucson, AZ. For more information, see www.sahra.arizona.edu/twm.
16-19	*Arid Regions 10th Biennial Conference—Restoration and Management of Arid Watercourses*. Mesa, Arizona. For more information, see www.azfma.org.
16-19	*2004 Ground Water Expo*, Las Vegas, NV. For more information, see www.ngwa.org.

December 2004

6–10	*First National Conference on Ecosystem Restoration (NCER)*, Orlando, Florida. For more information, see http://conference.ifas.ufl.edu/ecosystem.
7–9	*The Center for Watershed Protection's Stormwater Program Institute and Stormwater Design Institute*, White Plains, NY. For more information, see www.cwp.org/SPISDI.htm.
12–15	*Midwest Fish and Wildlife Conference*, Indianapolis, IN. www.in.gov/dnr/midwest2004.

January 2005

5–7	*Symposium on the State of the Science of Animal Manure and Waste Management*, San Antonio, TX. For more information, see www.cals.ncsu.edu/waste_mgt/natlcenter/sanantonio.htm.
23–26	*American Water Works Association (AWWA) Source Water Protection Symposium*, Palm Beach, FL. For more information, see www.waterwebster.com/AWWA2005Symposium.htm.

February 2005

1–3	*Nevada Water Resources Association Annual Conference*, Reno, Nevada. For more information, see www.nvwra.org.
2–4	*2005 Missouri Natural Resources Conference: Missouri's Resources, Shaping the Future with Leadership*, Lake of the Ozarks, MO. For more information, see www.mnrc.org.
5–11	*Society for Range Management 58th Annual Meeting and Trade Show*, Fort Worth, TX. For more information, see www.rangelands.org/texas2005/.
7–9	*USDA-CSREES National Water Quality Conference*, San Diego, CA. For more information, see www.soil.ncsu.edu/swetc/waterconf/main.waterconferenc.htm.
14–15	*American Water Resources Association's Second National Water Resources Policy Dialogue*, Tucson, AZ. For more information, see www.awra.org/meetings/Tucson2005.
20–24	*International Erosion Control Association's 36th Annual Conference and Expo*, Dallas, TX. For more information, see www.ieca.org/conference/annual/Dallas05.asp.

March 2005

5–10	*Third Conference on Watershed Management to Meet Water Quality Standards and Emerging TMDL (Total Maximum Daily Load)*, Atlanta, GA. For more information, see www.asae.org/meetings/TMDL2005.
13–16	*Emerging Issues Along Urban/Rural Interfaces: Linking Science and Society*, Atlanta, GA. For more information, see www.sfws.auburn.edu/urbanruralinterfaces.
14–17	*15th Annual West Coast Conference on Soils, Sediments and Water*, San Diego, CA. For more information, see www.aehs.com/conferences/westcoast.
March 30–April 2	*Third International Conference on Irrigation and Drainage*, San Diego, CA. For more information, see www.uscid.org/05idconf.html.

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