Nonpoint Source
News-Notes
August 2004, #73
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

EPA Partners with The Weather Channel for Runoff Education

A companion educational brochure is available at epa.gov/weatherchannel.

A half-hour television special about watersheds and stormwater runoff is now being seen throughout the nation on The Weather Channel. Co-produced by the Environmental Protection Agency and The Weather Channel, "After the Storm" explores how polluted runoff threatens the nation's waters. The program premiered on The Weather Channel on February 4, 2004; an additional showing is scheduled for Saturday, September 18, 2004 (8:00 pm and 11:00 pm EST). Information about the program is available at www.epa.gov/weatherchannel.

"I encourage everyone to tune in to learn more about the threats facing our nation's waters from polluted runoff," said Acting Assistant Administrator for Water, Benjamin Grumbles. "After the Storm shows the connection between weather and watersheds and the importance of watershed protection. We all live in a watershed and we all have an impact on our environment."

The program reminds viewers that a finite amount of fresh water exists on the planet, and that everyone needs to take actions to protect water resources. "Over the last thirty years, the nation has done a tremendous job in tracking pollution from large factories and sewage treatment plants," said Grumbles. "Remaining threats are much more difficult to regulate. When it rains or when snow melts, pollutants from city streets, suburban lawns, and farms may run off into our nation's streams, lakes, wetlands and coastal waters."

Inside this Issue

EPA Partners with The Weather Channel for Runoff Education (continued)

The show highlights three case studies—Santa Monica Bay, the Mississippi River Basin/Gulf of Mexico, and New York City—where polluted runoff threatens watersheds highly valued for recreation, commercial fisheries and navigation, and drinking water. Key scientists, water quality experts, and citizens involved in local and national watershed protection efforts provide insight into the problems as well as solutions to today's water quality crisis.

Acting Assistant Administrator Grumbles added, "EPA was pleased to team up with The Weather Channel on this educational special. Broadcast meteorologists are considered trusted and effective spokespersons for conveying complex environmental and scientific information to the American public, and millions of viewers tune in to The Weather Channel daily for the latest weather updates. Weather events—like droughts, floods, and rain—directly impact the quality of our water resources. They offer a perfect opportunity for meteorologists to discuss connections between weather and watersheds."

In addition to illustrating the environmental implications of weather events, the special provides useful tips on how people can help make a difference. "After the Storm" explains simple things people can do to protect their local watershed—such as picking up after one's dog and recycling household hazardous wastes. It also shows how some communities and private companies are getting involved through low impact development—utilizing rain gardens and green roofs to minimize stormwater runoff.

An "After the Storm" educational brochure is available for download and as a hard copy from EPA (information is available at www.epa.gov/weatherchannel). The brochure provides tips on preventing runoff from residential and commercial properties, farms, construction sites, automotive facilities, forestry operations, and others.

Want to Air the Program in Your Classroom?

VHS copies of the "After the Storm" program are available free for education and communication purposes in classrooms, at conferences, etc. However, the tape should not be reproduced, distributed, broadcast or cablecast, without the express written permission of EPA. If you have any questions, please send them to EPA at weatherchannel@epa.gov. The VHS copies of "After the Storm" will include captioning so the program is accessible to those who are deaf or hard of hearing. To order, call the National Service Center for Environmental Publications (NSCEP) at 513-489-8190 or 800-490-9198 or send an e-mail to ncepimal@one.net (request "After the Storm" (VHS), EPA 840-V-04-001).

Want to Air the Program in Your Town?

After Aug. 5, 2004, EPA will have full rights to the "After the Storm" program and will be making high quality Beta SP copies of the program available to cable and other television stations for their use. EPA is taking orders now for delivery AFTER Aug. 5, 2004. You may order on the Web site, or by calling NSCEP at 513-489-8190 or 800-490-9198 or e-mailing them at ncepimal@one.net (request "After the Storm" (Beta SP), EPA 841-V-04-001).

New EPA Technical Support Center Lends a Hand

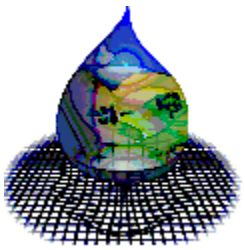
EPA recently established a Watershed and Water Quality Modeling Technical Support Center to provide assistance to EPA regions, state, and local governments, and their contractors in the implementation of the Clean Water Act. The Center, which is part of EPA's Office of Research and Development (ORD), is committed to providing access to technically defensible tools and approaches that can be used in the development of Total Maximum Daily Loads (TMDL), waste load allocations, and watershed protection plans.

What Kind of Technical Support is Offered?

The Center will provide the following types of assistance and technical support:

- Review of proposed TMDLs—provides a technical review and comments for proposed or pre-proposed TMDLs

New EPA Technical Support Center Lends a Hand (continued)



- Task Order Manager—serves as Task Order Manager for EPA's National Watershed Contract, providing technical oversight to ensure consistency and quality in the approaches taken to develop TMDLs
- Technical Advisory Group—Center staff participate as technical advisors
- Model Application—takes the lead in the application of models used in the development of TMDLs, implementation, waste load allocation
- Data Analysis—provides assistance in data acquisition and analysis
- Post TMDL Implementation—provides assistance in the development of TMDL implementation
- Best Management Practice Analysis—provides assistance in the selection and placement of BMPs in the watershed
- Research to develop and improve models for regulatory applications

What Tools are Available?

The Center provides access to a wide variety of tools and mathematical models that can be used to support the development of TMDLs, waste load allocations, and watershed protection plans. Most of the tools offered, including watershed models and hydrodynamic and water quality models, were developed and are being upgraded to serve the needs of the regulatory community better. Most of these tools have been enhanced to meet the needs of the TMDL program.

The Center also provides self-paced training on-line, sponsors specialty conferences, and offers regularly scheduled training classes around the county to educate people about the watershed and water quality models. Materials from these training classes will be available at the Center's Web site. For more information about the Center, see www.epa.gov/athens/wwqtsc, or contact Tim Wool by phone at 706-355-8312 or by e-mail at wool.tim@epa.gov.

News from State, Tribes, and Localities

Free Socks Put a Stop to Oily Bilge Water

Going boating in Massachusetts? Don't forget your socks. In 2002 the Massachusetts Office of Coastal Zone Management Marina Assistance Program distributed free bilge socks to more than 18,000 boaters to promote the use of these nonpoint source pollution-reducing tools. The bilge socks contain absorbent material that binds with petroleum products from a boat's bilgewater, preventing the release of these pollutants to the marina's waters when the bilges are pumped out. Last year the managers began an education program for boaters that reinforces the message to use bilge socks.

Bilge socks are long fabric tubes filled with absorbent material.

The type of tube-like bilge socks used are two feet long and three inches in diameter, and are placed directly in a boat's bilge compartment. A boat's bilge is found inside the hull at the very bottom of the boat. The bilge collects water and other fluids that are spilled on the interior sections of the deck, plus any water or petroleum products that leak from the engine. Boats typically have automatic bilge pumps that turn on and discharge the bilge water overboard once it accumulates to a particular level.

"Clean bilge water discharges will not harm coastal waters," explained Robin Lacey, program manager for the

Massachusetts Marina Assistance Program. "However, it is illegal to discharge bilge if it contains petroleum products or other pollutants. Since the bilge water pump is automatic, many people don't think about what is in the water that is being pumped overboard. Our giveaway program was an easy way to educate boaters about the impact bilgewater can have on the environment."

Building on Past Success

The program began in 2000 when the coastal program funded an effort by the Buzzards Bay National Estuary Program to distribute bilge socks to bay boaters. The program was so successful coastal managers decided to take it statewide. Organizers sought funding under Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA), which requires a State to "develop and implement management measures for nonpoint source pollution to restore and protect coastal waters …" Section 6217 requires states to establish coastal nonpoint source programs, which are then subject to federal approval.

Using implementation money received after the 2001 federal approval of their Coastal Zone Management Plan, Lacey says they went to vendors specifically looking for bilge socks made out of hydrocarbon-absorbing polymers, which can absorb 2.5 quarts of petroleum products per sock. "The polymers permanently bind the oil and solidify it so the oil can't be squeezed out, and won't even drip out. This way, you don't have a disposal issue. It can just be tossed out with the household trash." The sock manufacturer notes that a bilge sock should last one boating season, assuming the boat engine is well-maintained.

In early 2002, Lacey worked with regional coastal staff to develop a distribution plan for 10,000 socks, which retail for about $12 each. Harbormasters, watershed associations, and environmental groups all agreed to hand out the bilge socks to coastal boat owners. To save time and money, the vendor sent boxes of 50 socks directly to those who agreed to distribute them. "That way we didn't have to bring them in-house and then ship them back out," he says. The first 10,000 socks were distributed by the end of April 2002. With harbormasters asking for more, the program staff ordered an additional 8,200. Each sock distributed included a waterproof education tag with instructions, clean boating tips, and information about why the use of bilge socks is important (see www.enviro-bond.com/pub/bilgetag.pdf). The project cost $75,000, which included socks and educational tags.

The distribution program made an impact, noted Lacey. "Approximately 150,000 boats are registered in the state of Massachusetts, so we equipped more than 10 percent of them with bilge socks." Lacey estimates that the 18,200 socks distributed have the potential of removing 11,000 gallons of petroleum products from the state's coastal waters.

Putting the Best Socks Forward

While the bilge sock distribution was a one-time event, Lacey says they are currently building on the program by working to educate boaters and marina owners. The coastal program staff is creating written materials that can be distributed at marinas, and is also encouraging marina owners to require boats in their slips to have bilge socks, adds Lacey. "The marinas have an interest in keeping their waters clean. Requiring boats to have bilge socks is a step in the right direction." But not all boaters keep their boats in marinas. In the near future Lacey hopes to get the clean boating message out to additional boaters at boating events, boating safety classes, and in boat registration materials. "As we help boaters become more aware of their potential contribution to coastal water pollution, I expect to see more voluntary widespread use of products like bilge socks."

[For more information, contact Robin Lacey, Massachusetts Office of Coastal Zone Management Marina Assistance Program, 251 Causeway Street, Suite 900, Boston, MA 02114-2138. Phone: 617-626-1220; e-mail: Robin.Lacey@state.ma.us. This article was reprinted in part from the November/December 2002 issue of Coastal Services*, a National Oceanographic and Atmospheric Administration publication found at www.csc.noaa.gov/magazine/2002/06/mass.html.]*

Where Mitigation Really Works

Planning to impact a wetland or stream in North Carolina? According to state law, if you are impacting more than an acre of wetland or more than 150 linear feet of stream you must compensate for its loss. All states have similar rules; however, North Carolina is taking a unique approach to better ensure that the compensation equals the loss suffered. Often, projects that replace lost wetlands or damaged riparian areas do not function as effectively as the original site and therefore result in an overall reduction in watershed health. To prevent such losses, North Carolina's Ecosystem Enhancement Program (EEP), formally known as the Wetlands Restoration Program, has initiated a targeted mitigation effort. Rather than requiring developers to mitigate for small projects individually, the EEP collects mitigation dollars into a Wetlands Trust Fund. These dollars are then applied to selected large-scale wetland and riparian restoration projects that the state has identified as having the greatest potential to provide ecological health benefits.

The EEP is an innovative, non-regulatory program established by the North Carolina General Assembly in 1996 to restore wetlands, streams, and riparian areas throughout the state. As part of this task, the EEP is responsible for providing a consistent and streamlined approach to address compensatory mitigation requirements associated with Clean Water Act Section 401 and 404 permits issued by the North Carolina Division of Water Quality (DWQ) and the U.S. Army Corps of Engineers. For more information about these permits, see www.wetlands.com/regs/tlpge02a.htm.

Developing Plans Statewide

The EEP has developed Watershed Restoration Plans (WRP) for each of the state's 17 major river basins to help direct compensatory mitigation and restoration projects. These plans target specific watersheds within each river basin where restoration projects could contribute significantly to the goal of protecting and enhancing overall watershed functions. To develop the Watershed Restoration Plans, the EEP assesses the location and condition of natural resources using multiple information sources such as the NC Division of Water Quality's Basinwide Water Quality Plans, rare plant and animal lists, and wildlife management plans. The EEP reviews and revises these plans on a rotating 5-year schedule.

The EEP is also developing more detailed Local Watershed Plans (LWP), which are developed at a much finer scale. Through a 1999 agreement with the NC Department of Transportation (DOT), the DOT committed to provide $17.5 million over seven years to fund the development of 30 LWPs within cataloging units where DOT anticipates compensatory mitigation needs. This original agreement was with the EEP, but detailed watershed planning is an activity that has been embraced with the development of the EEP. Examples of completed plans and the locations of ongoing plans can be accessed through the EEP Web site: h2o.enr.state.nc.us/wrp.

To develop a LWP, the EEP conducts a detailed assessment of the watershed and involves the local community in identifying and implementing solutions to water quality and quantity problems. At a minimum, a LWP identifies potential stream and wetland restoration projects to help meet DOT's future compensatory mitigation needs. "The LWPs allow us to compare the probable benefits of one potential project in a watershed against another—to ensure that we get the greatest ecological benefit for the dollars spent," explained Suzanne Klimek, manager of the EEP Planning Section. Ideally, by developing a LWP, these restoration projects can be linked to other water quality and habitat improvement efforts initiated at the local level, such as stormwater management projects, water supply protection strategies, land use planning guidelines, and best management practice installation. Although they are being developed with DOT funds, the LWPs can provide targeting assistance for all restoration projects in the watershed.

Putting the Plans to Work

The WRPs (and LWPs where available) allow EEP to choose the best location for its wetland, stream or riparian buffer restoration efforts, including compensatory mitigation-related projects

Where Mitigation Really Works (continued)

implemented for DOT and other government and private clients. "When developers must mitigate for planned wetland or riparian impacts, they have three options in North Carolina: install a mitigation project themselves, purchase credits from a private mitigation bank, or pay into the Wetlands Restoration Fund," explained Klimek. EEP is tasked with using the funds paid into the Wetlands Restoration Fund to restore sites identified in the plans.

Because they consolidate the mitigation requirements of multiple small projects, the EEP can implement large-scale watershed restoration efforts that address significant water quality problems. "Rather than having small restoration efforts be spread over the landscape where their benefit is diluted, we focus our restoration efforts in certain key watersheds and increase the likelihood of having a significant benefit to ecological health," explained Klimek. "We try to implement projects in the same subwatersheds where the impacts occurred. If that is not possible, we always implement the projects within the same 8-digit hydrologic unit."

Over the past 5 years, EEP has accepted the compensatory mitigation requirements of 273 Section 404 permits and Section 401 Water Quality certifications. These cumulative mitigation requirements total 220,238 linear feet of streams and 252.34 acres of wetlands in 13 river basins. During FY02 (July 1, 2001 through June 30, 2002), 81 of the Section 401 Water Quality Certifications issued required wetland or stream mitigation. Of those, 69 percent were satisfied through payment to the EEP compensatory mitigation requirements, while seven percent were satisfied through payment to private mitigation banks. The applicants conducted the remaining 23 percent of the required compensatory mitigation on site.

The plans help EEP fulfill another of its important roles: providing compensation for wetland and stream impacts that are permitted but fall below the regulatory threshold requiring compensatory mitigation (wetland impacts less than one acre or stream impacts of less than 150 feet). These losses can be significant—approximately 53 wetland acres in FY02. To offset these losses, EEP completes restoration projects using appropriated funds, interest earned by the Wetlands Trust Fund, and grant awards. By planning ahead, EEP ensures that its restoration efforts will make a difference.

[For more information, contact Suzanne Klimek, Planning Supervisor, North Carolina Department of Environmental and Natural Resources, Ecosystem Enhancement Program, 1652 Mail Service Center, Raleigh, NC 27699-1652. Phone: 919-715-1835; e-mail: suzanne.klimek@ncmail.net.]

Notes on Watershed Management

Putting Pressure on Pressure Washing Pollution

"We dissolve nature's scourge away to restore the full beauty of your home and deck," reads an advertisement for a commercial pressure washing company. But where does the "scourge" go? And what about the cleansing agents used to remove it? Pressure-washing activities can pose pollution risks to nearby waterways if proper management techniques are not used. Fortunately, many local governments have stormwater ordinances that prohibit discharges of non-stormwater, such as wastewater from pressure washing, but compliance by businesses and individuals often remains an issue. One California region is taking steps to help residents and businesses comply with

Why is Pressure Washing a Problem?

Pressure washing involves using a stream of pressurized water, sometimes containing cleansing agents, to remove contaminants from surfaces. Pressure washing is typically used to clean surfaces such as pressure treated decks, sidewalks, parking lots, buildings, trash dumpster areas, and vehicles. The wastewater from washing these areas might contain pollutants such as detergents, oils, grease, sediment, trash, and heavy metals. If not properly contained, the pressure washing wastewater can flow into storm drains and directly into local waterways.

Putting Pressure on Pressure Washing Pollution (continued)

its existing ordinance by providing a best management practice (BMP) manual and creating an incentive program to encourage compliance.

As part of its effort to comply with its Phase I stormwater permit requirements, the Sacramento Stormwater Management Program (SMP), which includes the County of Sacramento and the cities of Citrus Heights, Elk Grove, Folsom, Galt, Rancho Cordova, and Sacramento, is turning its attention to an often-overlooked source of non-stormwater discharges to storm drains—mobile pressure washers. "Many of these folks are not aware that storm drains lead directly to local creeks and rivers and not to sanitary treatment facilities. They don't realize that the detergents and pollutants coming off of the surfaces are actually ending up in local waterways," explained Patrick Sanger, with the City of Sacramento's Department of Utilities. "We are working to educate mobile pressure washing business owners about the proper way to manage pressure washing wastewater."

The SMP offers educational resources to help pressure washing businesses learn about and take advantage of BMPs to comply with stormwater regulations. In November 2002, the SMP partnered with the Business Environmental Resource Center (BERC), and the Sacramento Regional County Sanitation District to release *Best Management Practices for Pressure Washers* (available for download at www.sacstormwater.org), which explains the steps that pressure washer operators should take before, during, and after a job.

What Can Pressure Washer Operators Do to Minimize Impacts?

Pressure washer operators, including homeowners, should adhere to the following key practices at a minimum:

- Plan ahead (identify sites and methods, obtain necessary permits and authorizations)
- Pre-clean (sweep debris and remove existing liquid contaminants using absorbents)
- Minimize water used
- Choose least-toxic cleaning products
- Collect wastewater (using vacuum pumps, booms/berms, portable containment areas, weighted storm drain covers, inflatable plumber's plugs, oil/water separators, holding tanks, portable sump pumps, hoses, and/or absorbents)
- Discharge collected waste water to sanitary sewer (or, if the water contains hazardous materials or compounds, through a licensed hazardous waste hauler)
- Discharge onto the land surface only permitted with the property owner's permission and only when the wastewater does not create a nuisance condition, flow into the storm drain system, and/or contaminate soil with hazardous waste

A full list of practices recommended by the Sacramento Stormwater Management Program is available in *Best Management Practices for Pressure Washers* (available for download at www.sacstormwater.org).

In June 2003, the partners held a workshop for the local pressure washing companies. BERC mailed workshop invitations to 250 organizations that described the workshop content and mentioned the availability of the BMP manual. More than 40 people attended the workshop and learned about regulations, best management practices, sanitary sewer discharge permits, and the opportunity to participate in the Clean Water Business Partners (CWBP) program. "We were pleased with the turnout," said Sanger. "We discovered that many of the attendees are already using some of the BMPs outlined in the manual. We also received great feedback about which BMPs work best for them." Other similar outreach efforts are planned for the future.

Putting Pressure on Pressure Washing Pollution (continued)

Promoting Pressure Washers through CWBP

Beginning in Summer 2003, the SMP included mobile pressure washers in its CWBP program and is relying on this program as a long-term outreach and education tool. The CWBP is an incentive-based program that rewards local businesses for promoting clean water awareness and implementing BMPs. The SMP initiated the CWBP in 1998 for carpet cleaners—another mobile business that generates polluted wastewater. In 2001, the CWBP expanded to include landscaping companies. Mobile pressure washing is the third industry targeted by CWBP. "The businesses who are helping to keep our waterways healthy should promote it to their customers. Our program rewards them for doing that," said Sanger.

The CWBP program offers many benefits to participating businesses, including:

- Promotion through the extensive CWBP program advertising campaign on radio, television, and utility bill inserts and other print formats
- Promotion on the CWBP web page
- CWBP brochures and door hangers
- Stormwater pollution prevention fact sheets
- Recognition by the public as a company that cares about local water quality

"In exchange for these benefits, the businesses agree to follow all the necessary BMPs and help us spread an environmental message." Businesses hand out brochures and other educational materials to their customers. The brochures include a tear-out survey on which the customer is asked to report where the employee disposed of wastewater (storm drain, sanitary sewer, or transported it away). Returned surveys are entered into drawings for prizes such as a free carpet cleaning. "Occasionally someone will report improper disposal by CWBP participants. We follow up and let the business owner know that they need to better educate their employees. We have 60 businesses represented in the program so far and we've only had to remove two for not complying with the terms of the program."

The pressure washer CWBP program currently has over a dozen members. Sanger anticipates that more will follow as they realize the benefits. "The returned surveys indicate that more and more consumers are choosing a business based on whether it is environmentally responsible. We've had several companies sign up for the program because they didn't want to lose business to the CWBP members." The most recent biennial public awareness survey conducted by the SMP in March 2004 showed that 84 percent of the population is willing to pay at least 5 percent more for services supplied by environmental friendly companies, and 64 percent of respondents are willing to pay 15 percent more.

That is the idea behind the CWBP, Sanger adds. "Our goal with the program is two-fold: educate the public and educate the businesses. When both happen together, then the businesses can use their environmentally friendly practices as a marketing tool and a more enviro-savvy public can demand it of their service providers. The hope is that normal business economics will encourage those companies that choose to not obey the laws and continue to illegally discharge to the storm drain system to either change their practices or find another line of work."

Not a CWBP Participant? You Still Must Comply with the Ordinance!

Although the SMP's stormwater ordinance prohibits non-storm discharges, they do not have the staff to monitor all potential offenders. "The industry is still mostly self-regulated," explained Sanger. "We have stormwater inspectors, building inspectors, and other staff who will report illegal discharges if they see them, but we don't have anyone out patrolling the streets for mobile pressure washers or carpet cleaners. We rely quite a bit on the general public—they do a good job of reporting violations using our stormwater hotline." SMP staff follows up on reports and issues fines as necessary.

Putting Pressure on Pressure Washing Pollution (continued)

Spread the News

The success of the CWBP Program has attracted the interest of other communities dealing with stormwater issues, noted Sanger. "I frequently receive calls and e-mails from people throughout the U.S. and beyond. They want to hear about our program and learn how they can start a similar one in their area." The key to the CWBP's success is the mutually beneficial nature of the program, added Sanger. "We help the businesses and they help us."

[For more information, contact Patrick Sanger, City of Sacramento, Department of Utilities, 1395 35th Avenue, Sacramento, California 95822. Phone: 916-264-0126; e-mail: psanger@cityofsacramento.org.]

"Builders for the Bay" Leads to Consensus on Codes

During the summer of 2003 in Harford County, Maryland, a diverse group consisting of local government planners, builders, county engineers, environmental groups, real-estate developers, and lawyers completed a negotiation and consensus-building process that paves the way for changes in the layout and construction of new development. The diverse group explored subdivision regulations and municipal and road codes to identify and overcome obstacles in current codes that unduly restrict on-site construction practices to the detriment of environmental protection goals.

The end-product of the 'roundtable' as the negotiation was officially called, was a consensus document that lays out recommendations for 22 separate development principles designed to help protect open space, reduce impervious cover, and minimize the negative impacts of stormwater runoff associated with new residential and commercial development. The document further includes explicit language for changes in county codes that would support the principles. Participation of county staff from the Harford County Department of Planning and Zoning, familiar with the intricacies of current county codes, was key in enabling the successful formulation of potential new codes.

Lying within the watershed of the environmentally-sensitive Chesapeake Bay, Harford County's water pollution mitigation efforts were supported by the "Builders for the Bay" partnership, established in December 2001 to promote sound land use development throughout the Bay watershed. The Harford County roundtable is the first of twelve planned for the entire Chesapeake Bay Watershed under Builders for the Bay, which is sponsored by the Center for Watershed Protection (CWP), the Alliance for the Chesapeake Bay (ACB), and the National Association of Home Builders (NAHB). Harford County's roundtable was supported in part by the Abell Foundation, the Cafritz Foundation, and the Chesapeake Bay Trust.

The CWP completed its second Builders for the Bay Roundtable in November 2003 in south central Pennsylvania. For more information about this effort see the December 5, 2003 issue of Watershed Weekly (www.pawatersheds.org/Wweekly) printed by the Pennsylvania Organization for Watersheds and Rivers.

What Will Code Changes Achieve?

Code changes recommended by the roundtable are intended to make it easier for developers to create more open space and include more flexible features in the design of residential and commercial sites. Developments created using 'better site design' principles incorporate less impervious cover, conserve more natural areas, and produce less stormwater runoff, ultimately helping to minimize the construction- and development-impact on the Chesapeake Bay and its tributaries. In addition to being more environmentally sensitive, residential communities constructed with better site design have the potential to be seen as more attractive and livable, and may accrue higher market values.

Examples of the changes recommended by the roundtable include:

- establishing minimum and maximum parking ratios that may reduce impervious pavement

"Builders for the Bay" Leads to Consensus on Codes (continued)

- reducing home setback requirements in order to preserve more open space, preserve natural hydrology, natural stream trajectories, and continuous patches of forest
- allowing flexible standards for sidewalks to allow alternative pedestrian routes that help to limit paving on sensitive areas
- preventing private lots from encroaching on county-designated Natural Resource District protection areas

For a complete listing of the recommendations, see www.cwp.org/Harford_consensus.pdf.

Harford County's document focuses on site-based efforts to mitigate building and paving impacts on water quality. "Many communities are struggling with issues of where development should occur, but how we design the sites already designated for growth is also critical in protecting our water resources," explained Anne Kitchell, a watershed planner with the Center for Watershed Protection. "If every community in the Chesapeake Bay region were to do what Harford County has done, it would be a big step in minimizing the impact of future growth on the Bay."

Environmentalists and developers alike are excited about the success of the Harford County roundtable project. Susan Davies of the Home Builders Association of Maryland (HBAM) was impressed with both the process and the product. "How encouraging that all different interest groups were able to coordinate and work together on what ended up as a fairly comprehensive document," she said. Enthusiastic about recommendations that she sees as readily achievable, she added that "there's a potential for good changes in the not-too-distant future."

HBAM President Don Sample echoed Davies' optimism. "We're very enthusiastic … it'll help property owners derive more value, and help the environment—what could be better? We were really pleased that CWP and the ACB were willing to not just talk about the problems, but really do something that makes a difference."

Building on early successes with Builders for the Bay Roundtables, CWP intends to sponsor other Bay watershed counties, townships, and localities in their efforts to revise municipal and building code and manage growth in an environmentally sensitive manner.

[For more information on Builders for the Bay or the Harford County Roundtable, contact the Center for Watershed Protection, 8391 Main Street, Ellicott City, Maryland 21043; Phone: 410-461-8323; e-mail: ack@cwp.org; Web: www.buildersforthebay.net.]

News in Agriculture

Innovative Pest Control Curtails Runoff-Prone Chemicals

As members of the agricultural community strive to move away from the use of chemicals, they turn more frequently to innovative practices, including natural biological pest controls. The first article explains how nuisance rodent populations in vineyards are being held in check by encouraging proliferation of the pest's natural predator—owls. The second article describes how pecan orchard yield and quality are being increased by growing trap crops that lure stink bug pests away from the pecan crop. In both cases, innovative farmers are saving money, reducing dependence on chemical pesticides, and improving the environment. This theme of innovative pest control practices continues into the Technical Notes section immediately following these articles. (See "Army Uses GPS Targeting to Win Golf Course Bug Battle.")

Owls Control Vineyard Gophers

Using rodenticides to control rodent pests? Try owls instead! A new nonprofit group, called Habitat for Hooters (HFH), is promoting the use of owls as a sustainable, environmentally-friendly method of controlling vineyard rodents in Napa Valley, California. To encourage owls to hunt in and around vineyards, HFH and its partners have been working for the past 3 years to improve owl habitat, primarily through the placement and maintenance of owl houses. HFH provides free consultations, bird banding, and box maintenance to HFH members, taking that opportunity to gather data for future analysis.

Why Not in Vineyards?

The program is the brainchild of Janet Barth, a teacher and wildlife rehabilitation volunteer. "I had heard of a group that was using barn owls to decrease rodent populations in sugar cane fields. I thought 'why not in vineyards?'" Napa Valley vineyards are popular with pocket gophers, who enjoy building tunnels in the loose cultivated soil, drinking from the irrigation lines, and eating grapevines. They eat the vine's new growth and will sometimes kill the vines by girdling them underground.

Barth mentioned her owl idea to the local Resource Conservation District (RCD) and the Habitat for Hooters (HFH) project was born. She received a $2,500 grant from the City of Napa to fund the program development. Several vineyards also donated money to offset her start up costs. Officially launched in 2000, the organization focuses on distributing and maintaining owl boxes, educating vineyard owners and community members about owls and owl habitat, and collecting information about the local owl population.

HFH relies on membership fees from vineyards and private citizens for annual support, and applies for grants from the wine industry to support special projects and equipment needs. Members receive a discount on owl houses, and receive free consultation services for owl banding and house placement and maintenance.

To attract members, Barth initially mailed a brochure and order form to all Napa Valley vineyards. The response was overwhelming. "It took us almost a year to fill all the box orders that we received from that first mailing." Since then, Barth has given many presentations to school groups, civic groups, and environmental groups. The program has also received media coverage in a local newspaper and several newsletters. Barth publishes an annual newsletter that reports the project's progress and lists all members. Membership (now at almost 150 members) continues to rise and box orders continue to come in as people hear about the program during a presentation, from friends, or learn about it from the media. Community members and vineyard owners have installed almost 500 boxes since the program began.

Is the Project Making a Difference?

"Unfortunately, we didn't have a base population count when we began the program, so we don't know for sure whether we have increased the population," explained Barth. "However, the owls were certainly looking for places to live. In one vineyard we placed 6 boxes the first year. Within 2 weeks, all were occupied. Last year we placed 15 more boxes, 90 percent of which are now occupied. That tells me that nesting sites are at a premium, which is not surprising given the ongoing loss of forest in the Napa Valley area."

According to the Napa RCD, a barn owl will eat an average of 155 pocket gophers per year. "The vineyard owners can see the result of the owls' appetites," said Barth. "When I clean out the owl boxes each year we usually find about 12 inches of owl pellets. The vineyard owners are thrilled because they know the owls are earning their keep." If the owls successfully keep rodent populations down, the vineyard owners will be less likely to resort to other methods of rodent control that are toxic to the environment.

Building Boxes Yield Profits

Building and distributing owl boxes is a key component of the HFH program. HFH arranged with the wood shop in the Vintage High School Agriculture Department's Resource Occupation Program to build most of its owl boxes. The wood shop uses the profits to invest in supplies and equipment. Customers are asked to donate $40 per box, $10 of which is used to cover materials and $30 of which is provided to the box builders. The students made $8000 for the wood shop during the program's first two years. When demand is high or the students are on summer vacation, other organizations such as boy scouts and environmental groups earn some money by helping to build boxes.

Owls Control Vineyard Gophers (continued)

The Future

Barth has been banding and monitoring owls since the program began. "Our focus is now shifting from selling boxes to gathering data. We hope to do more educational outreach, using the data as a tool," explained Barth. HFH plans to conduct research on the effectiveness of the owl box program by tracking the owl populations and studying diet composition and dispersal and migration patterns. She recently partnered with the local high school's biology department to have students conduct a one-time owl pellet dissection and analysis lab. Pleased with the results, she plans to apply for a grant that will allow her to pay students to conduct a comprehensive prey study.

Barth is also mentoring a group in nearby San Raphael that plans to conduct controlled studies to see whether owl habitat improvement can definitively yield natural reductions in rodent populations. "A study like this is needed—currently all available supporting information is purely anecdotal." In the meantime, HFH will continue to use its available data to open the public's eyes about the benefits of owls as a natural pest control.

[For more information, contact Janet Barth, Habitat for Hooters, Mailing Address: Napa County Resource Conservation District, 1303 Jefferson Street, Suite 500B, Napa, CA 94559. Phone: 707-224-3464; e-mail: wesaw1@mindspring.com; Web: www.naparcd.org/habitatforhooters.htm]

Trapping Stink Bugs the Natural Way

Kyle Brooksheir, a West Texas pecan grower, has been able to produce higher grade pecans while reducing pesticide application. While every orchard is different, and more study needs to be done, integrated pest management may prove to be a superior method for pest control.

Pecans damaged by stink bugs.

Adult stink bugs lay eggs on weeds and crops like pecans, and their populations increase in summer. As crops are harvested and weeds dry up, adults fly to pecans to feed. Stink bugs suck sap from developing pecan nuts, causing the nutlets to fall from the tree. Feeding after shell hardening causes brown or black spots on the kernel, which gives the nut a bitter taste and reduces the cash value of the crop. Because stink bugs can feed directly through the hard shell, producers are faced with the problem that the pecans can be damaged up to the day of harvest, and even after harvest, while the nuts are being taken to the shelling plant. Due to human health concerns, effective insecticides cannot be applied within three to four weeks of harvest.

Rows of black-eyed peas lure stink bugs away from pecan trees.

For many years, growers minimized pest damage to pecans by spraying insecticides combined with a zinc spray. However, applying insecticides has had to be reevaluated because fewer effective insecticides are available due to high re-registration costs, lack of new insecticides, poor insecticide control, secondary pest outbreaks, and renewed concerns about the effects of insecticides on humans and the environment. Routinely using insecticides leads to pesticide resistance, destroys natural enemies of pecan pests, and increases production costs.

Setting a Trap

Trap cropping is a technique where a producer deliberately plants a second type of plant that the pest desires more than the cash crop. For pecan producers, black-eyed peas can serve as an effective trap crop to draw stink bugs away from valuable pecan trees. A Sustainable Agriculture

Trapping Stink Bugs the Natural Way (continued)

Research and Education Program grant-funded study was conducted during 1994 and 1995 at a West Texas pecan orchard and suggested advantages of trap cropping.

When the research team compared stink bug damage losses between site/years with trap crops and those without trap crops, they noted a $29.29 per acre benefit from trap crops on average. For each dollar spent in establishing and maintaining the trap crops, the team observed a nine dollar benefit on average.

Brooksheir reports that before trap cropping he lost between 10 and 11 percent on his crop every year. After trap cropping, his losses fell to less than 2 percent. He notes, "It was clear very quickly that it was a profitable practice for us."

$ Loss/Acre from Stink Bugs

	1993	1994	1995
Orchard #1 (650 acres)	12.54*	0.62	2.21
Orchard #2 (400 acres)	9.45*	21.26*	79.40*

*No trap crop.

Brooksheir plants black-eyed peas between the rows of pecan trees at the ratio of one acre of peas for every 20 acres of pecans. Starting around the first of July, he plants a section of peas every two weeks to keep maturing pods always available for the bugs. Since the bugs prefer the peas, they stay away from the trees. Because Brooksheir does not need to spray the peas, his family has fresh peas for the table all summer.

Besides getting more cash for his crop, trap cropping saves Brooksheir money on pesticide, reduces the possibility of polluted runoff, and, as he laughingly remarked, "We enjoy eating the fresh peas."

[For more information, contact Kyle Brooksheir, Box 216, Van Horn, TX 79855. Phone (915) 283-2506; e-mail kylenina@telestar1.com. Alternatively, contact Bill Ree, Extension Agent Pest Management - Pecan-IPM, P.O. Box 2150, Bryan, TX 77806-2150. Phone: 979-845-6800; e-mail: w-ree@tamu.edu; Web: http://pecankernel.tamu.edu.]

National Agricultural NPS Pollution Management Measures Now Available

EPA has released the updated *National Management Measures to Control Nonpoint Source Pollution from Agriculture*, a technical guidance and reference document for use by State, local, and tribal managers in the implementation of nonpoint source pollution management programs. This guidance document is intended to provide technical information on the best available, economically achievable means of reducing NPS pollution of surface and ground water from agriculture. The guidance provides background information about agricultural NPS pollution, where it comes from and how it enters the nation's waters, discusses the broad concept of assessing and addressing water quality problems on a watershed level, and presents up-to-date technical information about how to reduce agricultural NPS pollution.

The causes of agricultural NPS pollution, specific pollutants of concern, and general approaches to reducing the impact of such pollutants on aquatic resources are discussed in the Overview (Chapter 2). A general discussion of best management practices (BMPs) and the use of combinations of individual practices (BMP systems) to protect surface and ground water is provided in Chapter 3. Management measures for nutrient management; pesticide management; erosion and sediment control; managing facility wastewater, manure and runoff from animal feeding operations; grazing management; and irrigation water management are described in Chapter 4. Also in Chapter 4 are discussions of BMPs that can be used to achieve the management measures, including cost and effectiveness information. Chapter 5 summarizes watershed planning principles, and Chapters 6 and 7 offer overviews of nonpoint source monitoring and pollutant load estimation, respectively. For more information, or to download a copy of the manual, see www.epa.gov/nps/agmm.

Technical Notes

Army Uses GPS Targeting to Win Golf Course Bug Battle

Cutting-edge science solved an environmental problem for an age-old game. In the mid-1990s Ruggles Golf Course on Maryland's Aberdeen Proving Ground had a serious June bug problem. The June bug population grew so large that after intense spraying in the fall of 1995, dead June bug larvae made such a stink and so thickly covered the fairways and greens that the course had to be closed. To make matters worse, birds were dying after eating the dead larvae. Adding insult to injury was the possibility of long-lasting pesticide leaching into the groundwater, and of surface runoff carrying pesticides into Chesapeake Bay. Something had to be done.

The Right Idea

Enter the Army's Center for Health Promotion and Preventive Medicine, Entomological Sciences Program, which has a long-term working relationship with the Agricultural Research Service (ARS) of the U.S. Department of Agriculture. Beginning in the 1970s, the ARS had recommended identifying areas where pests live and breed at maximum concentrations and targeting those areas for treatment. This would greatly reduce the amount of pesticide necessary to control the pests while also reducing the environmental impact.

Going High Tech

In the 1990s, the advancement of the global positioning system (GPS) and geographic information systems (GIS) provided ARS with a new technology to locate and map the areas with the highest concentrations of pests. In 1996, ARS received funding from the Strategic Environmental Research and Development Program (SERDP), a partnership between the Department of Defense, the Department of Energy, and the Environmental Protection Agency, to develop new software and conduct pilot projects using GPS and GIS to pinpoint concentrations of pests.

In 1998 a partnership between the U.S. Army Environmental Center, the ARS, and the SERDP was formed to test the new methods using GPS and GIS at several military sites. Army golf courses were some of the first of these sites. ARS used GPS and GIS to locate and map the areas with the highest concentrations of pests. After successful testing on the golf course on Fort Meade, the technology was applied the next year to a pilot project on the 18th hole at Ruggles.

Attacking the Invaders

ARS began the June bug eradication effort in August 1999. By that late in the summer the larvae had grown large enough that their location was evident by mounds and tunnels on the surface of the ground. ARS located areas of greatest concentration on the 18th fairway and entered the coordinates into the GPS system. These key areas turned out to cover only 20 percent of the fairway and surrounding rough. ARS then targeted these areas for pesticide application.

Spraying in the morning with a quick-acting, low-environmental-persistence pesticide resulted in dead larvae by the afternoon. The spraying was as effective as broadcast spraying in reducing the larvae infestation and resulted in significant time and cost savings. The rest of the course was then mapped and sprayed with similar success, and Ruggles Golf Course did not have significant recurrence of larvae in the following years. Thus, the long-term effectiveness of the targeted application was better than the broadcast spraying that had been conducted the previous 6 years, was less expensive, and posed a reduced environmental risk.

Researchers also determined that soil moisture and thickness of thatch could predict areas with a high probability of June bug larvae and other types of grubs. Based on this information, the recommended method was application of pesticides only to areas with sufficient moisture and depth of thatch in the early summer when the larvae are small. This reduces the need to broadcast persistent pesticides over the golf course early in the spring, avoids the damage associated with tunneling activities of the larger grubs, and reduces problems of high numbers of large, dead larvae on the golf course.

Army Uses GPS Targeting to Win Golf Course Bug Battle (continued)

The program achieved 95 percent control of the green June bug larvae. The cost of investing in the technology was paid back after only two years by the savings from reduced pesticide use and labor. Other benefits included the ability to use pesticides with less persistence in the environment, less worker and golfer exposure to chemicals, and a golf course that stays open during June bug season. Additional project details are outlined in a report developed by the Mid-Atlantic Integrated Assessment, available at www.epa.gov/maia/html/junebug.html.

Expanding the Program

The program's success has not gone unnoticed. The project team received the inaugural "Pollution Prevention Project of the Year" award in December 1999 from the Strategic Environmental Research and Development Service. The Department of Defense is now implementing similar efforts at some if its other facilities. The Ruggles Golf Course may even be more chemical-free soon—the course superintendent sees the benefits of the technology and hopes to expand its use to target and treat invasive weeds such as clover and nutsedge.

[For information contact Richard Brenner, USDA ARS, 5601 Sunnyside Avenue, GWCC-BLTSVL, Beltsville, MD 20705-5131. Phone: 301-504-6905; e-mail: richard.brenner@nps.ars.usda.gov; Web: www.apgmwr.com/recreation/golf.html or www.epa.gov/maia/html/junebug.html.]

Recycling to Reduce Runoff: Compost on Road Cuts

Compost is gaining popularity as a tool for revegetating steep slopes. A section of the Blue Ridge Parkway near Asheville, North Carolina was affected by a rock- and soil-slide in late May 2002, closing the parkway. While the road was being repaired, the slope of the road cut had to be restored and stabilized quickly to prevent excessive runoff from heavy summer rains. To do this, the Federal Highway Administration (FHWA), which manages highways on Federal lands, aimed to establish vegetation on the repaired slope. On this site, traditional approaches to stabilization, such as hydroseeding and root reinforcement systems, were challenged by fickle May temperatures, rocky and poor soils, and very steep slopes. After reviewing available options the FHWA decided to apply a combination of compost blankets and netting to the slope.

The Compost Advantage

Research and field trials show that compost works effectively in stabilizing steep slopes and preventing erosion. Although hydroseeding—a grass-planting process that consists of spraying a mixture of hay, straw, fiber mulch, water, fertilizer, agricultural lime, grass seed, and a tackifier—helps control runoff, it is found to be less erosion-resistant than compost on the kind of tricky terrain that the Blue Ridge Parkway section presented.

Composted organic material such as mixtures of peat moss, bark, processed wood chips, lawn grass clippings, manure, and other materials stimulate the chemical, physical, and biological characteristics of soil. The result is healthy vegetation growth: compost improves root growth, and enhances the germination of grass or other vegetation that reinforces the slope.

Absorbency is an additional bonus in helping control runoff. This benefit is important on steep slopes where the soil is too poor and nonabsorbent for vegetation to become established. Compost can absorb as much as the first half inch of a rainfall.

In this project the compost method was found to be more economical than hydroseeding. The cost of this technique ranged from 20 to 50 cents per square foot, depending on the accessibility and steepness of the slope. The cost included seed, 1 to 3 inches of compost, turf reinforcement netting, compost filter berms around the perimeter, and the berms applied in increments on the contours across the slope.

Although the cost of hydroseeding is typically about seven to 10 cents per square foot, the vulnerability to erosion on such a steep slope may be higher than with the compost technique. This area was more rock than soil, so a growing medium was needed for the vegetation, and the compost provides that medium. To use hydroseeding on steep slopes would require a root system

reinforcement mat placed prior to seeding, along with at least some soil/seed mixture with a temporary rolled mat on top to prevent erosion. The seven to 10 cents includes only the hydroseed application. Compared with the hydroseeding method, including the two mats and soil/seed mixture, the compost method is more economical.

Applying Compost and Making it Stick

The bulk of the time spent on the project consisted of clearing and grubbing the area and removing the slide material. During excavation operations, the substrate was roughed parallel with the contours of the slope using backhoe teeth. While grading the slope, the contractor made a point of avoiding "slicking off" (i.e., smoothing down to a hard surface) and avoiding making vertical claw marks that would have channeled water. Instead, the machinery was used to create indentations or imprints every few feet to prepare the substrate for a seedbed.

Prior to applying the compost, rock climbers rappelled down the slope to place lockdown netting to increase the strength of the root system and reduce the risk of a blanket root system failure. As the grass roots penetrate the compost netting, they bind and tie the compost blanket and berms to the ground surface. The netting served to increase shear strength long enough for the seed to germinate and begin to grow before the compost could slide down the slope. A biosolids-based compost was mixed with nutrient-enhanced leaf compost and wood fibrous-composted mulch and then was blown using blower-truck technology to form a blanket of compost over the netting.

Heavy equipment clears the slide material to prepare for compost application.

The contractor used a pneumatic blower to apply the compost.

Vegetation was reestablished on the slope within 5 months of the slide.

To break up the flow of water and prevent it from concentrating, mesh tubes filled with compost and grass seed were laid and staked across the entire slope. After the grass is established, they biodegrade and act as a biofilter.

It Worked!

On the second-to-last day of the compost installation, a storm brought rainfall of 3 inches per hour. Although a small breech and some rilling occurred, the breech self-healed, and the rilling stopped. The rainstorm's timing proved fortuitous, enabling FHWA to observe the performance of this technology under a heavy rain.

The FHWA completed the work on June 28, 2002. The next major test was the drought during summer 2002. Although the dry conditions caused the vegetation to grow less densely than was

Recycling to Reduce Runoff: Compost on Road Cuts (continued)

desirable, adequate vegetation was established. The compost with the seed prescription was designed to account for such seasonal climatic conditions. Although the grass germinated and then dried up, the seed in the compost mixture enabled the grass to regerminate when the growing conditions were right.

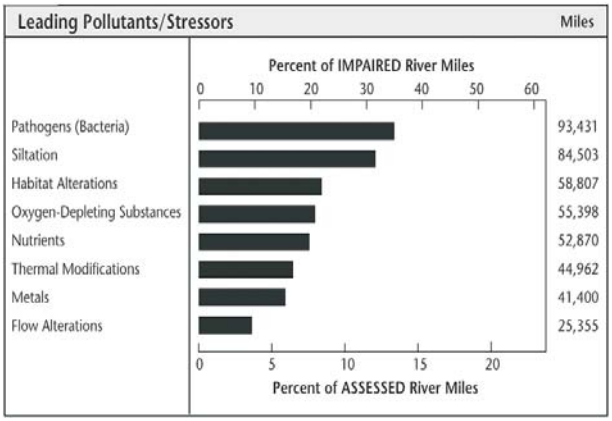
As the process-knowledge of using compost in highway construction evolves, FHWA may consider adopting this method as a best management practice. As a method, composting can be used for temporary erosion and sediment control during construction phases and permanent erosion and sediment control through establishing sustainable vegetation. Not only does compost appear to be as good as or better than conventional erosion control methods, but it also offers the environmental benefit of recycling biodegradable wastes that might otherwise end up in landfills.

[This article was abridged and reprinted with permission from the March/April 2003 issue of Public Roads *(Vol 66 - Number 5), located on-line at www.tfhrc.gov/pubrds/03mar.* Public Roads *is published twice monthly by the U.S. Department of Transportation Federal Highway Administration. For feedback on the magazine contents, contact Martha Soneira via e-mail at Martha.Soneira@fhwa.dot.gov or by phone at 202-493-3468. For further details on the project contact Mitch King, Project Engineer, FHWA Eastern Federal Lands Construction Division, 112 Industrial Park Drive, Sevierville, TN 37862. Phone: 865-453-7123.]*

Removing Bacteria from Runoff: An Overview of Strategies

How serious is the problem of unhealthy levels of bacteria in our nation's waterways? In terms of both the number and miles of waters identified as impaired under the latest Clean Water Act (CWA) 303(d) listings, pathogens are identified as the most commonly violated category of water quality standard (see graph). Thus, high bacteria levels in U.S. waters account for the single greatest obstacle to achieving full compliance with the Clean Water Act's "fishable and swimmable" goals. While it is impossible to be certain how much is attributable to point sources, much—perhaps most—is associated with nonpoint sources from both urban and agricultural sources.

In Virginia, approximately half of the stream miles listed as not meeting water quality standards are impaired by bacteria. Other states are only now getting around to listing bacteria-impaired waters. A review of Virginia's waters impaired by bacteria and the 92 bacteria Total Maximum Daily Load (TMDL) studies Virginia has developed to date, reveal that these impairments are associated with high population densities of either people or livestock.



Pathogens are the most commonly cited cause of water quality impairment (U.S. EPA 305(b) 2000 Report, released September 2002).

Although states are developing TMDLs to allocate loads among various point and nonpoint sources, including a growing number that are informed by high-tech bacteria source tracking, increased knowledge and awareness is needed to help program managers develop mitigation and protection strategies for pathogens. Two main strategies may be followed simultaneously: source control and in-drainage mitigation. Below is an annotated list of options for each strategy. Other options may exist, as well.

Source Control Strategies:

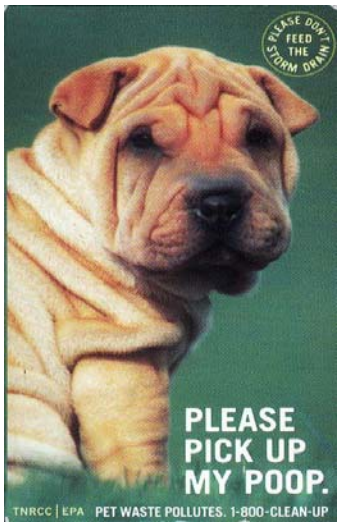
- Low impact development (LID) techniques—A low impact development is one that seeks to mimic a site's predevelopment hydrology by reducing impervious surfaces and taking advantage of opportunities to infiltrate, filter, retain, evaporate, and slow down runoff close to its source. LID techniques can be applied to new and existing development using decentralized micro-scale or lot-level controls to manage rainfall and runoff. Reducing the

volume of runoff decreases the potential for bacteria to be transported into storm drains. For example, a downspout can be designed or modified to redirect runoff from rooftops with bird droppings toward pervious areas capable of infiltrating the runoff. Likewise, any pet waste left near a rain garden or bio-infiltration cell is less likely to pollute nearby streams than pet waste left along a roadside ditch. See www.epa.gov/nps/lid for more information on low impact development.

- Riparian buffering—Vegetated or forested riparian zones can be used to provide buffers between impacted land uses and water resources in both urban and agricultural areas. The riparian zones help in two ways. First, they physically separate high concentrations of humans and domesticated animals from waterways. Second, the riparian zones serve as overland filters for treating animal waste to the extent that these zones are directly downslope of the impacted land use. Virginia recently issued guidance on implementing TMDLs that contain estimates that bacteria can be reduced by 43 percent to 57 percent by implementing proper riparian buffers, especially in agricultural watersheds (*Guidance Manual for Total Maximum Daily Load Implementation Plans*, Virginia Department of Conservation and Recreation and Department of Environmental Quality, July 2003).

- Street sweeping—A 1993 study by Roger Bannerman with the Wisconsin Department of Natural Resources identified streets and parking lots as significant sources or carriers for bacteria and other urban pollutants. Bacteria have an affinity for attaching themselves to fine sediments, and can form biofilms on gutters, both of which can be swept away. It is important to use sweepers that have good efficiencies for removing the tiniest particles. A new generation of high efficiency vacuum street sweepers has reversed the criticisms that earlier types of sweepers performed poorly in the Nationwide Urban Runoff Program studies of the early 1980s (see *News-Notes* Issue #56, February 1999, "State-of-the-art Street Sweepers Could Reduce Suspended Solids in Receiving Waters"). However, research to quantify a bacteria load reduction benefit from street sweepers is lacking.

- Pooper scooper enforcement, public campaigns, and the free market—While many localities have some form of legal code banning pet waste in public areas, most localities put little or no effort into enforcement. A combination of ratcheting up enforcement and public education campaigns has been effective from New York to Texas. The Texas Commission on Environmental Quality recently developed and distributed public outreach materials to encourage more owners to pick up after Fido. New billboards and magnets that show a Shar-Pei dog and the message "Please pick up my poop" are helping to garner public attention to this issue. Another idea is to issue warning tickets that explain the problems associated with pet waste. Finally, with names like "Doody Calls" (www.doodycalls.com) and "Wholly Crap" (www.whollycrap.com), some entrepreneurs are getting into a new business that's really "picking up."



Pet waste campaign message from the Texas Commission on Environmental Quality developed in 2002.

- Dog parks as BMPs—An environmentally friendly dog park is one that is sited away from environmentally sensitive features, such as floodplains, and provides a safe off-leash fenced area, public education signage, free pooper scooper bags, and sanitary trash receptacles. Such dog parks function as social crucibles for transferring the conscientious behavior of responsible pet owners who pick up after their pets to less conscientious owners, and thus helping to establish a new social norm. According to Judy Green, Executive Director of the Northern Virginia Dog Park Coalition, if the dog park is set up correctly, "the peer pressure on newcomers to pick up after their pets really works." Sponsorship and acceptance

of responsibility by a local dog group for each dog park helps ensure accountability and success.

- GeesePeace techniques—By humanely decreasing nuisance resident geese populations, a new organization called GeesePeace is reducing the amount of bacteria-laden geese droppings in particular areas. This organization is "dedicated to building better communities though innovative, effective, and humane solutions to wildlife conflicts." The GeesePeace solution is a site-specific recipe of integrated programs that may include egg addling (which requires a permit from the U.S. Fish and Wildlife Service), vegetative barriers around waterbodies, border collie patrols, goose repellants (such as the safe, all-natural grape compound Methyl Anthranilate, or MA for short), and publicly signed and enforced "no feed" zones. While GeesePeace focuses on strategies specific to nuisance waterfowl populations, the concepts of humane and effective solutions may be applicable to other animals with unnaturally high populations or exotic invasive species such as raccoons, nutria, rats, and other animals that have adapted to man-made environments in population densities far greater than would be found naturally. For more on GeesePeace and its approaches, visit www.geesepeace.org.

- Illicit discharge detection and elimination—Dye tests, smoke tests, mobile TV inspections through storm sewer systems, flow monitoring, and remote sensing are some of the tools that can be used to detect and eliminate illicit discharges that may contain human waste or other pathogens. These are presented in an EPA fact sheet online at cfpub.epa.gov/npdes/stormwater/menuofbmps/illi_2.cfm. Optical brightener monitoring is a variation on dye testing that can detect persistent ultraviolet man-made dyes common to laundry detergent in storm sewer systems or downstream of failing septic systems. When the optical brighteners are detected in the environment or storm sewer system they indicate the presence of laundry effluent, which is a component of human sewage. See *News-Notes* Issue #63 (www.epa.gov/owow/info/NewsNotes/issue63/63_issue.pdf) or the Summer 2003 issue of *The Volunteer Monitor* (www.epa.gov/owow/monitoring/volunteer/issues.htm) for more information on optical brightener monitoring.

- Cattle/livestock fencing, alternative water sources, and livestock waste management—Cost-share programs through soil and water conservation districts (SWCDs) are often available to assist farmers who are concerned that excluding cattle and other livestock from nearby streams means an end to a cheap and convenient source of water for their livestock. Alternative watering systems may be supplied via solar pasture pumps, electric pumps, and even animal-operated pasture pumps. A growing number of states have successfully restored bacteria-impaired streams in agricultural watersheds by fencing out livestock from excessive stream access. Other agricultural BMPs that have been shown to be effective for reducing bacteria runoff include constructing roofs over concentrated feeding areas, stabilizing livestock access areas, and constructing animal waste storage facilities. See also *News-Notes* Issue #71 for an example of effective equine waste management.

In-drainage Mitigation Strategies:

- UV disinfection—At least three applications of ultraviolet (UV) light disinfection of urban runoff have been installed in the U.S., and others may soon follow. So far, all are located in southern California. In 2002, a UV treatment system was installed at a storm drain outfall along Moonlight Beach in the City of Encinitas. The city spent $438,000 to design, construct, and install the multi-stage UV light disinfection system within a 9-foot by 24-foot box culvert. The system is designed to treat baseflow, up to 150 gallons of flow per minute (0.3 cfs); significant wet weather events trigger an automatic shut-off and bypass the treatment unit. System maintenance is limited to periodic cleaning and UV lamp replacement every nine months to a year. So far, bacteria counts are being reduced from levels in the 100s, 1000s, and 10,000s of colony-forming units (cfu) per 100 milliliters (ml) of water going into the UV unit to just 2 cfu/100 ml for most of the baseflow periods leaving the treatment unit. This experimental project is profiled in the May/June 2003 issue of *Stormwater Magazine*, available online at www.forester.net/sw_0305_moonlight.html. In

July 2003, Orange County installed a UV unit capable of treating 140 gallons per minute at an outfall to Aliso Creek near Aliso Viejo. And this spring, Orange County, California, installed two UV treatment units inside a double box culvert that feeds a creek channel and drains to Poche Beach between Dana Point and San Clemente. In 2001, the City of Laguna Niguel in Orange County, California installed a temporary UV treatment system at a storm drain outfall to treat bacteria during dry weather. Monitoring data showed this unit to be effective while it was operational, however it was replaced in 2003 by a network of constructed wetlands designed to treat dry weather flows and urban runoff from small storms. Runoff from larger storms bypasses most of the wetlands.

- Ozone treatment—An ozone treatment system for removing bacteria from urban runoff is being constructed by another southern California Pacific beach community—the City of Dana Point. At $4.6 million, this system is more expensive than the UV systems installed in nearby communities, but it will handle flows that have diminished water clarity and will be capable of treating up to 1000 gallons per minute (2.2 cfs). In this case, the catchment includes baseflow with naturally high concentrations of manganese and iron.

- Infiltration BMPs—Infiltration BMPs can include trenches, sand filters, porous pavement, permeable pavers, filter strips, and rain gardens. Just as properly sited, designed, and maintained septic systems that rely on infiltration have proven effective at controlling bacteria and other pollutants from wastewater, other types of infiltration facilities can be effective at controlling bacteria and other pollutants from stormwater. As long as adequate separation distances are maintained, bacteria are not likely to contaminate groundwater resources. In the case of sand filters, where infiltrated waters are returned to surface drainage, five of six studies catalogued in the second edition of the National Pollutant Removal Performance Database for Stormwater Treatment Practices (National Database) showed that these systems were effective at removing 36 percent to 83 percent of the bacteria. However, one study of a sand filter in Austin, Texas showed a net increase in bacteria.

- BMP ponds—In general, lakes have significantly lower bacteria levels than the streams and rivers that feed into them, but the data are more variable for small ponds. Given that bacteria levels increase with turbidity and that bacteria tend to cling to sediments, bacteria may be removed from the water as these sediments have a chance to settle out. To the extent that BMP ponds promote settling (and inhibit resuspension during high flow events), they will likely remove significant amounts of bacteria. In general, larger, deeper ponds with forebays are likely to do a better job of removing bacteria than smaller ponds without forebays, as re-suspension becomes less of an issue. The National Database documents bacteria removal efficiencies from ten studies that show that properly designed and maintained wet ponds can remove significant amounts of bacteria (46 percent to 99 percent for 9 of 10 studies). Unmown vegetative buffers around ponds are useful for many reasons, including their value for discouraging geese and other bacteria-contributing waterfowl that otherwise flock to easy-grazing fields of grass mown up to the water's edge (typical of golf courses and many BMP ponds). See www.novaregion.org/pdf/NViron13-1.pdf for more discussion on geese and BMP ponds.

- Constructed wetlands—While bacteria reduction results from constructed wetland studies are more varied than results from wet ponds, constructed wetlands have been demonstrated to be very effective in certain applications. For example, the preliminary data from Laguna Niguel (see "UV disinfection" section above) suggests that the three-cell wetlands network will be capable of reducing fecal coliform bacteria by more than 90 percent for baseflow periods and small storms. An Australian study published in 2000 by Cheryl Davies and John Bavor showed that a constructed wetland outperformed a BMP wet pond at removing bacteria from runoff and attributed it to settling and bacterial predation. The use of constructed wetlands in wastewater treatment for removal of bacteria and other pollutants is well documented.

- Floc agents—According to research published last year, polyacrylamide (PAM) is effective at intercepting bacteria, nutrients, and suspended sediments when added to irrigation water. The research was conducted by James Entry and Robert Sojka with the USDA's Agricultural Research Service and demonstrated that when PAM alone was added to irrigation water, populations of bacteria from cow and pig leachate were reduced by about 90 percent. When PAM was used in combination with either aluminum sulfate or calcium oxide, bacteria counts were reduced from farm runoff by about 99 percent. This research is described in more detail in the July 2002 issue of the USDA's *Agricultural Research Journal*, available on the Internet at www.ars.usda.gov/is/AR/archive/jul02/pam0702.pdf. According to the USDA, PAM is a relatively environmentally safe flocculent agent available in many varieties that can be categorized into three basic types: anionic, which has no known aquatic toxicity and is recommended for outdoor use; cationic, which is recommended for use by wastewater treatment plants and certain other industrial applications; and non-ionic, used more rarely for specific mining applications. It is the safest form that is typically used for irrigation water and for erosion and sediment control. Floc logs embedded with PAM are designed to release this polymer into streams at slow, controlled rates, and are becoming increasingly popular for removing suspended sediments contributed by stormwater runoff. Because of the affinity that fecal coliform bacteria have for suspended sediments, floc logs also hold promise for pulling bacteria out of the water column, although more research is needed to verify this. Another floc agent is chitosan, a biopolymer typically obtained from chitin in crab shells. Chitosan has been shown to be effective at coagulating clay-sized particles suspended in runoff, which causes them to settle out of the water column. It may be that chitosan also has application as a bacteria-reduction agent in streams with high levels of sediment and bacteria, since bacteria behave similarly to clay particles in the water column.

- Alum injection—When injected into storm drains at the right dosages, alum has been used to coagulate the bacteria and suspended sediments through ionic bonding and settle them out of the water column. Alum injection has been used successfully in parts of Florida to substantially reduce nutrients, turbidity, and bacteria. However, alum injection might be an option of last resort because of toxicity concerns when pH levels cannot be maintained between 6 and 7, relatively high capital and operating costs, and potential aesthetic impacts. More information on alum injection for bacteria control is available online at www.stormwater-resources.com/Library/077PBactiRemoval.doc.

- Catchbasin insert with antibacterial coating—A proprietary, patented catchbasin insert with a special antimicrobial coating, AbTech's Smart Sponge Plus, is being investigated by municipalities and a state agency for its effectiveness at reducing bacteria from runoff entering storm sewers. The Smart Sponge is a product designed to trap oil and other hydrocarbons as they enter the urban storm drain system. The Smart Sponge Plus adds an antimicrobial coating to the basic Smart Sponge polymer. This coating is an organosilane that is bonded to the Smart Sponge polymer. The coating acts as an electrically charged "sword" to attract negatively charged microbes such as fecal coliform bacteria, puncturing their cell membranes and killing them upon contact. More information on the antimicrobial agent is available on the Aegis Environment web site at www.microbeshield.com; Aegis Environment is AbTech's partner for the Smart Sponge Plus. The New Hampshire Department of Environmental Services is currently field-testing the performance of this product, and a final report is expected later this summer. Several Pacific Coast municipalities in southern California, including Newport Beach, Long Beach, and Manhattan Beach, have recently installed the antimicrobial version of the Smart Sponge in storm drain catchbasins and are conducting their own field monitoring, as well. Preliminary field results from New Hampshire and southern California have been mixed, but this technology may continue to evolve.

As a final note, some researchers have pointed out that in pristine watersheds, not only are bacteria source loadings lower than they are in urban watersheds by several orders of magnitude, natural

stream systems with intact headwaters have balances of predator-prey microbial communities. In the microbial realm, relatively larger microbes like heterotrophic nanoflagellates, paramecia, rotifers, and others, prey on the smaller fecal coliform bacteria to help keep their populations in check. These larger predatory microbes are known collectively as bacterivores. With regard to heavily degraded urban and agricultural stream systems, Virginia Tech biologist and bacteria DNA fingerprinting pioneer Dr. George Simmons notes that a stream with consistently high bacteria levels "indicates a microbial community that is out of balance." He believes that certain types of bacteria, such as *E. coli*, may be considerably more adaptable than their natural predators to highly impacted streams. To solve this problem, he advocates restoring natural conditions and functions into degraded streams to encourage greater bacteria predation.

[For more information, contact Don Waye, U.S. Environmental Protection Agency, 4503T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460. Phone: 202-566-1170; e-mail: waye.don@epa.gov.]

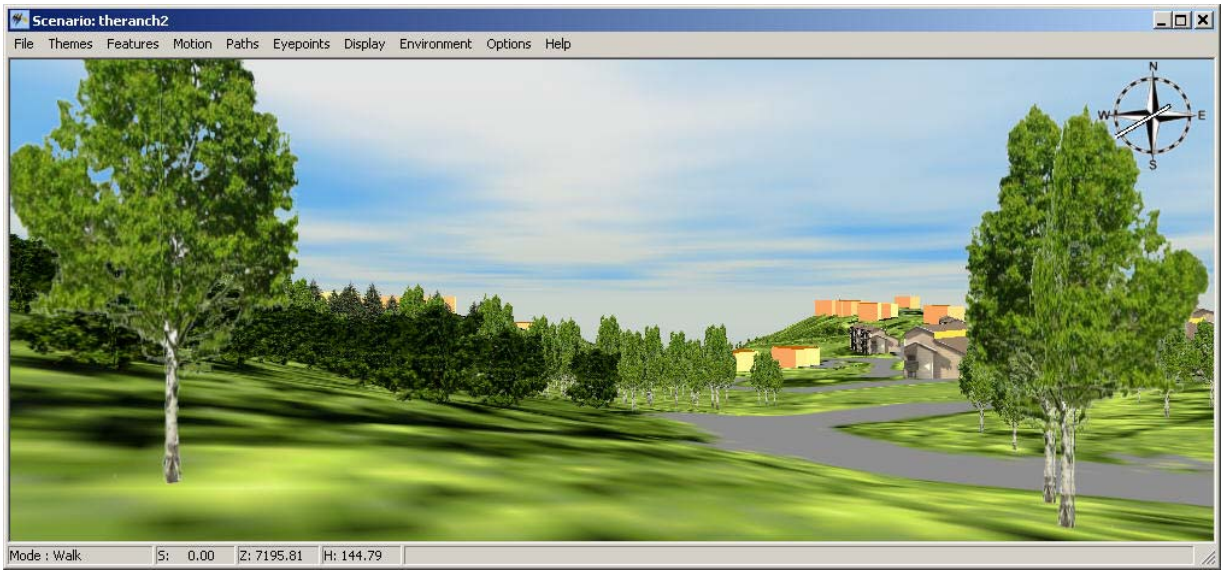
Software Spotlight

CommunityViz: Planning Made Transparent

In an era when both planning professionals and citizens have access to various demographic and natural resource data over the Web, there is a marked need for tools that can integrate the data in ways that generate meaningful information for growth planning, and more importantly, citizen inputs into these processes.

A GIS-based tool called CommunityViz appears to be exciting the planning community, especially those working in smaller municipalities and rural areas, by filling the need for data integration. Sponsored to the tune of $10 million in research and development by the Orton Family Foundation (www.orton.org) based in Vermont, the software grew as a response to a need that founder Vyman Orton himself felt during his experiences working in small town planning boards in Vermont. The software has the potential to empower the citizen participant in the planning process by visually presenting potential impacts of different proposed development scenarios. It allows planners and citizens who are involved in the review and comment process to understand the benefits as well as compromises of a given development plan, and therefore, consider a growth scenario more meaningfully.

Alongside the increasingly popular GIS capability of analyzing viewsheds in 3-D from different vantage points, users can also analyze and quantify a proposed development's impact on a host of environmental and economic variables: in effect, evaluate the impact that proposed growth will



Example of 3D viewshed impact.

have on issues of interest, including utility infrastructure cost, open space, post-development runoff quantities, and projected impacts on water quality. These additional capabilities are typically not available to planning boards and citizen stakeholders. Using the software, however, allows incomplete or speculative information on the future to be converted to a rational, modeled report. A post-development scenario may be accompanied with: (1) projected costs (e.g., the cost to run utility lines to houses in one layout configuration, as opposed to another, costs of extending sewer lines versus septic systems), (2) expected revenues from new tax bases, and (3) environmental indicators (e.g., total land required for utility easements, and new roads, expected total impervious surface after development). Such information is usually available only piecemeal, in individual analyses from sources such as the private developer, the municipality, the utility companies.

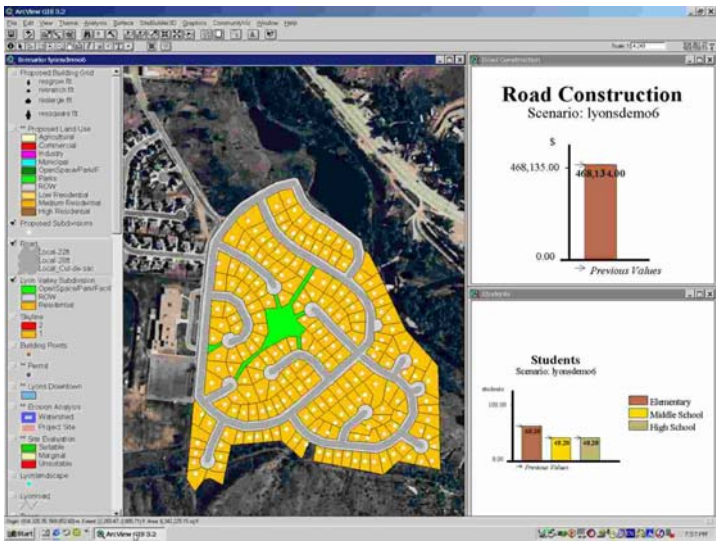
"The software doesn't provide the answers," says Doug Walker, managing director of Boulder, Colorado-based CommunityViz. "It is just a tool to reveal information that can be well utilized in any growth planning process." The software allows users to set the parameters for growth before the design stage and then evaluate the design against those parameters. For example, the user can define community goals such as environmental and economic goals (e.g., preserve 'x' amount of open space within this boundary, retain existing wetlands in location 'y', allow 'n' new commercial zones). It allows users to define limitations and caps (e.g., cost ceilings for new sewer lines in the proposed development, current regulations, zoning limitations, etc.). The software can generate a spatial and numerical analysis of a proposed development design as evaluated against these goals.

Because the software is fairly complex to use, a review in GeoWorld magazine (October 2002) suggests that for maximum effectiveness, a GIS specialist is required to navigate the software, and to format and enter data, in combination with a planning committee or a group of informed citizens. This is similar to requirements for any GIS-analysis system, which requires technical and information systems skills. A workshop on land use impact assessment tools hosted by the Wisconsin Department of Natural Resources for public officials, watershed groups, town planners, and other interested parties was another test of the software's usability. The general consensus was that CommunityViz was useful in planning applications and that it would raise the public's level of discussion regarding land use decisions. However it was tempered with concern about the cost and training required to use the tool effectively. (Proceedings of Changing Landscapes: Anticipating the Effects of Local Land Use Decisions, March 31 and April 1, 2003, Madison, WI)

Watershed Applications

There are several watershed based applications of the software. "I've used CommunityViz to do a runoff-sensitivity analysis for a watershed", said Lex Ivey, consultant to CommunityViz. He used soil, slope and landcover data, embedded the Universal Soil Loss Equation (USLE) into the software, and then evaluated the impact of a ground disturbance by adding a building footprint. He placed the building at different sites in the watershed and was able to compare the different sites in terms of vulnerability to runoff.

"The flexibility of the software is that it provides the framework for a variety of variables that can be defined for a local site," says Ivey. A classic example of the software's use is in optimizing the cost of mitigating nutrient pollution by using BMPs at different sites in a watershed. "Using costs that we define for the local area, we were able to define a target budget for



Example of proposed subdivision design.

CommunityViz: Planning Made Transparent (continued)

mitigation practices for a watershed. We also defined the appropriate BMP for a particular type of landcover. We then evaluated different sites in the watershed for BMPs, and the rest was just crunching out the numbers; we got a spatially referenced cost-spreadsheet that we could fine-tune and optimize for our budget and nutrient removal effectiveness." Because of the software's visual interface, Ivey says a programmer is not needed to add variables nor to manipulate them. For example, a slider bar may be used to increase the quantity or size of a BMP, such as adding more mulch to the ground. The runoff analysis can be re-run with different quantities of the BMP.

Data that the software is designed to utilize includes digital aerial photography, existing municipal geographically referenced data, such as zones, roads, land use, buildable land, etc. More advanced policy simulations require demographic and business information, sales and income tax information, wages and consumption information. The model library that comes with SiteBuilder 3-D offers a library of over 2500 residential and building models that can be used in the visualization.

[For more information, contact Lex Ivey, Consultant, CommunityViz, 1035 Pearl Street, Boulder, CO 80302. Phone: 303-442-8800; e-mail: lveylivey@communityviz.com; Web: www.communityviz.com.]

Notes on Education

Preaching Environmental Stewardship in American Samoa

One of the biggest challenges for public awareness campaigns is reaching the target audience with the intended message. Coastal resource managers in American Samoa have found that a good way to do this is to put the message in the context of a community's cultural understanding. "Our culture is very important to us," says Tali Tuinei, assistant public awareness coordinator with the American Samoa Coastal Management Program. "In Samoan society, there is no separation of society and religion. Our motto is 'Put God First.'"

Map of American Samoa

American Samoa is a group of five volcanic islands and two coral atolls in the South Pacific, located fourteen degrees below the equator, about half way between Hawaii and New Zealand. American Samoa became a U.S. territory in 1900.

Because Christianity plays such a major role in the lives of the American Samoan people, Tuinei says, the coastal program staff created a Religious Consciousness Project to help spread the word about the islands' environmental problems. "We saw this as a vehicle to expand our existing outreach program," she says. "Our hardest audience is adults. It's easy to go into schools and get kids to accept our message, but it's harder to get that message to adults."

In 1999 they created a task force of 12 representatives from the various religious denominations on the islands. Tuinei explains that they also contracted with a reverend at a correctional facility to serve as a liaison between the government agency and the churches. At the taskforce's suggestion, the coastal program held a series of workshops with the Sunday school teachers, ministers, and other representatives of the territory's various denominations. "We presented to them the environmental issues we have facing us now and what needs to be done to save the natural resources. We divided each workshop into groups and asked them to provide an action plan by the end of the workshop and give us suggestions on the best way to implement the plan," Tuinei says.

Ideas that came out of the workshops included encouraging ministers to put the environmental message into their sermons; putting the message into the local televised religious service, which rotates weekly between the different denominations; and incorporating the message into summer and Christmas programs. The idea that has had the most impact, says Tuinei, is having the churches hold a special meeting and invite the coastal program managers to present information

Preaching Environmental Stewardship in American Samoa (continued)

on issues such as water quality, population growth, wetlands preservation, and nonpoint source pollution.

Having the church's reverend moderate the meeting usually encourages the congregation to be more open to the environmental message. "You might be quick to insult someone you don't know, but you would never insult your own pastor," she says. "Most of the people . . . listen and ask questions and by the end want to know more about how they can help."

Other benefits of the project include new contact lists that have expanded the coastal program's outreach into the villages. Tuinei explains, "For years we've tried to get the village mayors to help us, and that was unsuccessful. As a result of this project, we've had a village mayor workshop that has helped us start a water quality project." They hope to build on these contacts, she says, "so that we can reach the individual chiefs in the villages and then into the village councils."

Tuinei notes that the project hasn't always been easy, pointing out that the staff person conducting the process left and it languished until the position could be filled, and that every time they tried to evaluate the taskforce's progress, the group would assume its job was over. "We had many problems along the way," she says. "The message we want to send out is that it was a good idea. The project was not perfect, but we learned from our mistakes."

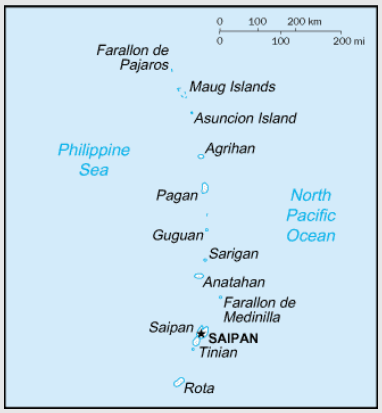
[For more information on the American Samoa Religious Consciousness Project, contact Tali Tuinei at 684-633-5155 or by e-mail at TTUINEI@doc.asg.as. This article was reprinted in part with permission from the November/December 2002 issue of Coastal Services, a National Oceanographic and Atmospheric Administration publication found at www.csc.noaa.gov/magazine/.]

Project Contributes to Success

American Samoa's coastal nonpoint program under Section 6217 of the 1990 Coastal Zone Act Reauthorization Amendments (CZARA) was recently approved in part because of the Religiousness Consciousness Project. American Samoa faces problems with pollution-rich runoff from numerous poorly managed, small-scale piggeries. Runoff on the mountainous islands is amplified by heavy tropical rainfalls, steep slopes, and thin soils, and leads to excessive erosion. According to the EPA Office of Water, American Samoa's religious consciousness project uses a localized, cultural-based approach to public education that helps address these nonpoint issues. For more information about CZARA and American Samoa's coastal nonpoint program, see http://coastalmanagement.noaa.gov/czm/6217.

The Northern Marianas' Drive to Protect the Beach

The cultural tradition of families picnicking on the beach in the Commonwealth of the Northern Mariana Islands is clashing with the environment. As the number of vehicles on the islands has increased over the past decade, the illegal but accepted practice of driving off-road to a favorite picnic spot is now destroying vegetation and sea turtle habitat, and is contributing to nonpoint source pollution. The off-road traffic accelerates beach erosion and can leak petroleum products. A collaborative education campaign has been put into gear by the islands' natural resource managers to begin the challenging process of changing the behavior of beachgoers.



Map of the Northern Mariana Islands

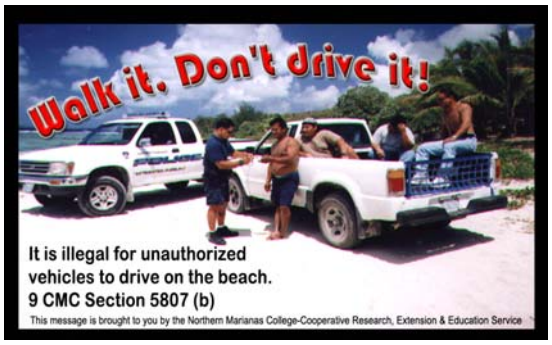
The Mariana Islands archipelago is located about three-quarters of the way from Hawaii to the Philippines in the western Pacific Ocean. The archipelago consists of the 14 islands of U.S. Commonwealth of the Northern Mariana Islands (CNMI), plus the southernmost island of the U.S. Territory of Guam. The CNMI is a self-governing Commonwealth of the United States. Islanders are not allowed to vote in federal U.S. elections, but they enjoy all of the other benefits of U.S. citizenship. The Northern Mariana Islands are about 2.5 times the size of Washington, DC and have a population of approximately 80,000.

"This was never a great concern until about 10 years ago when the number of cars on island drastically

increased," says Kathy Yuknavage, environmental health specialist with the Northern Marianas College Cooperative Research, Extension, and Education Service. "Most people are unaware that there is a law making it illegal to drive on the beach," explains Erica Cochrane, Northern Marianas Coastal Resource Management Office coral reef coordinator. "We needed an educational campaign because most of the island residents aren't aware of the impacts."

Yuknavage notes that while driving on the beach is illegal, authorities believe it to be a minor infraction, and with a limited workforce, citations are rarely written. The islands' law enforcement agency, however, participated in the education campaign.

The "Walk it, don't drive it" campaign includes slide public service announcements (PSAs) shown before each movie at the only movie theater on the islands, multiagency presentations at schools, student field trips, and the involvement of the islands' elders, or Man am'ko.



Two of six PSA slides shown at the islands' movie theater.

The program began in 2002 when Yuknavage, who calls beach driving one of her pet peeves, surveyed drivers at gas stations. She also took aerial photos of the beach and completed a beach count to determine the pervasiveness of the problem. Of the 700 people surveyed, 68 percent said they were unaware of the law prohibiting off-road driving. Of the 32 percent that knew about the law, only four percent admitted driving on the beach, but 15 percent responded affirmatively when asked if they had ever gotten stuck in the sand. A count of cars at a popular beach showed that 70 percent of beachgoers drive on the beach.

Yuknavage says the survey shows that many people didn't consider driving to their favorite spot to drop off a picnic basket actually driving on the beach. "Our biggest problem was that we needed to get our message across about the law and why it was written."

Yuknavage turned to the local theater to get her message across. She worked with artists from Northern Marianas College and their Cooperative Research, Extension and Education Service to create six slide PSAs that run in rotation before each movie. The slides feature striking images, such as an exaggerated photo of a truck running over a sea turtle, with tag lines about why driving on the beach is harmful or unwise. The islands' Man am'ko are featured in one slide because they are so culturally respected and remember when few cars were on the beaches.

Yuknavage worked with Cochrane and staff at other natural resource agencies to create PowerPoint presentations on the topic, which they presented to students, along with business-size cards with information on the environmental impacts for the children to pass out to friends and family. Two college students took the presentation to local high school classes. With the help of the tourism association, 50 students went on field trips to beaches for hands-on observation of driving impacts. These students were then given thank you cards to distribute to law abiding beachgoers.

In February 2003, after almost a year of outreach, the team conducted follow-up written surveys of drivers (randomly selected at local schools), as well as a car count at the beach. The surveys showed that 58 percent of drivers were aware of the law prohibiting off-road driving, compared to 32 percent in 2002. Survey respondents indicated that they had learned about the law primarily from local television news (45 percent), followed by newspapers (38 percent), PSAs (17 percent), thank you cards from children (five percent), and from their child who learned it in school (two

The Northern Marianas' Drive to Protect the Beach (continued)

percent). The car count revealed a corresponding decrease in beach traffic: only 40 unauthorized cars were noted driving onto the beach, a 27 percent decrease from the year before.

While awareness of the law appears to have increased, both Cochrane and Yuknavage agree that change will come slowly to the islands. "It's a great approach that we'd like to duplicate many times over," Cochrane emphasizes. "Just because it's slow doesn't mean we shouldn't do it."

[For more information on the "Walk it, don't drive it" campaign, contact Kathy Yuknavage at 670-664-8311, or via e-mail at kathy.yuknavage@crm.gov.mp. This article was reprinted in part with permission from the March/April 2003 issue of Coastal Services*, a National Oceanographic and Atmospheric Administration publication found at www.csc.noaa.gov/magazine/.]*

Reviews and Announcements

Adopt-a-Stream Educator Guide Newly Revised

After a year of editing, the Georgia Adopt-a-Stream Educator Guide is finally available. Designed for grades K-12 and for youth groups, the guide takes key stream-related messages and outlines them in fun and interactive lesson plans. Lesson plans have been correlated to the Georgia Quality Core Curriculum standards, which can be reviewed on the Adopt-a-Stream Web site at riversalive.org/aas.html, and by selecting "Teacher's Corner." Although designed for Georgia, the guide contains useful information and ideas for educators in all regions. To receive a copy of this educator guide, please call Georgia Adopt-a-Stream at 404-675-1636 or e-mail kimberly_morris-zarneke@mail.dnr.state.ga.us.

Freshwater Invertebrates Guide Helps Backyard Nature Enthusiasts

Popular interest in the observation and study of freshwater invertebrates for use as indicators of water quality is increasing. *A Guide to Common Freshwater Invertebrates of North America* serves as a wonderful tool to help people identify and learn about the freshwater invertebrates present in their local waterways. Section I of the book provides background on the biology and ecology of freshwater environments and explains why and how this group of organisms can be studied, simply and without complex equipment, in the field and the laboratory. Section II describes nearly 100 of the most common groups of invertebrates and provides a whole-body color illustration, along with brief text pointing out the most important features to use to identify group members. Section III contains expanded descriptions of the life history, behavior, and ecology of the various invertebrate groups, and identifies their important ecological contributions and relationships to humans. The book was written by J. Reese Voshell, Jr., illustrated by Amy Bartlett Wright, and published in Spring 2002 by McDonald & Woodward Publishing Company. Soft cover copies costs $29.95 and may be ordered by phone by calling 800-233-8787 or on the Internet at www.mwpubco.com/inverts.htm.

Guidance for Streambank and Lakeshore Stabilization Available

A Soil Bioengineering Guide for Streambank and Lakeshore Stabilization provides information on how to successfully plan and implement a soil bioengineering project, including the application of soil bioengineering techniques. Readers learn the basic principles and background information on ecology and the stream dynamics that are needed before attempting a restoration project. This guide is applicable to those who plan restoration projects and for those engaged in the day-to-day construction and maintenance of water-related recreation facilities, including dispersed areas, forest roads, and trails. It is also appropriate for persons interested in learning more about soil bioengineering stabilization techniques and how to apply them.

The guide was published in October 2002 by the U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center. A copy is available for download at www.fs.fed.us/publications/soil-bio-guide.

New Video Documents Tribes Protecting Water Resources

EPA recently released a video that documents the successful protection of water quality on Native American reservations. "Our Water Our Future: Saving Our Tribal Life Force Together" shows the efforts of the Pueblo of Acoma in New Mexico and the Confederated Tribes of the Chehalis Reservation in Washington in developing water quality standards. Tribal elders and leaders and the directors and staffs of tribal environmental departments recount their experiences. The tribes took positive steps to protect present and future generations by adopting water quality standards for their reservations. EPA approved the Pueblo of Acoma's water quality standards in 2001 and those of the Confederated Tribes of the Chehalis Reservation in 1997. Segments of the video can be viewed online at www.epa.gov/waterscience/tribes/videoreal.htm. Tribal-adopted and EPA-approved water quality standards for these two tribes (and for other authorized tribes) are available online at www.epa.gov/waterscience/standards/wqslibrary/tribes.html. EPA is distributing copies of the video to all federally recognized Indian tribes. Copies are also available by contacting Eleanor Jackson by phone at 202-566-0052 or via e-mail at jackson.eleanor@epa.gov. For more information, contact John Millet at 202-564-7842 or via e-mail at millett.john@epa.gov.

Receive Free Watershed Academy Web CDs

Watershed Academy is now offering a free CD version of its popular online watershed training program, *Watershed Academy Web*. Since its beginnings in 1996 *Watershed Academy Web* has provided a broad overview of the fundamentals of watershed protection and management through the Web site www.epa.gov/watertrain. All the peer-reviewed modules are interactive, rich in visuals, and written in a style to optimize understanding of technical materials by general audiences. The Certificate Program, which requires the completion of 15 modules and passing their interactive tests, now has over 500 graduates in 47 states and 16 countries. A number of professors use *Watershed Academy Web* modules as a framework for their college courses. To request free CDs go to www.epa.gov/watertrain/getCD.html. Orders for up to 50 CDs require no special approval, and can be obtained by requesting "Watershed Academy Web on CD" publication no. EPA 841-C-03-001 via one of the following: e-mail: ncepimal@one.net; phone: 800-490-9198 (toll-free); 513-489-8190 (local); mail: U.S. Environmental Protection Agency, EPA Publications Clearinghouse, P. O. Box 42419, Cincinnati, Ohio 45242.

Riparian Buffers All the Rage

Is your locality considering adopting a buffer ordinance? Are you a homeowner thinking of converting your streamside lawn to a buffer? South Carolina is now offering riparian and vegetated buffer publications that can help you. The Department of Health and Environmental Control's Ocean, and Coastal Resources Management (OCRM) Planning Division staff recently reviewed and compiled current literature on vegetated buffers. The review resulted in two easy-to-read informative booklets: one for both local government officials and citizens of South Carolina, entitled *Vegetated Riparian Buffers and Buffer Ordinances* (www.scdhec.net/ocrm/pubs/buffers.pdf), and a second for homeowners, entitled *Backyard Buffers for the South Carolina Lowcountry* (www.scdhec.net/ocrm/pubs/backyard.pdf).

Although written for South Carolina, these documents present information applicable to a wider audience. To further assist local government officials and the public, OCRM also offers *A Model Riparian Buffer Ordinance* (www.scdhec.net/ocrm/pubs/model.pdf), which lists suggested components of a buffer ordinance. For more information, or to request hard copies of these publications, please contact Ward Reynolds, SC DHEC OCRM, 1362 McMillan Avenue, Suite 400, Charleston, SC 29405; Phone: 843-744-5838 ext.141; e-mail: reynoldsww@dhec.sc.gov.

Study Shows Link Between Forest Protection and Drinking Water Quality

A new study, conducted by The World Bank/World Wildlife Fund Forest Alliance, shows that protecting forest areas can provide a cost-effective means of supplying many of the world's biggest cities with high quality drinking water, providing significant health and economic benefits to urban populations. The team's report, titled "Running Pure: the Importance of Forest Protected Areas to Drinking Water," shows that more than a third of the world's 105 biggest cities—including New York, Jakarta, Tokyo, Los Angeles, Barcelona, Nairobi, and Melbourne—rely on fully or partly protected forests in catchment areas for much of their drinking water. Well-managed natural forests minimize the risk of landslides, erosion and sedimentation. They substantially improve water purity by filtering pollutants, such as pesticides, and in some cases capture and store water. According to the report, adopting a forest protection strategy can result in massive savings. For more information, and to download a copy of the report, see www.forest-alliance.org.

Urban Subwatershed Restoration Manual Series Available

Under a cooperative agreement from EPA's Office of Wastewater Management and Office of Wetlands, Oceans, and Watersheds, the Center for Watershed Protection (CWP) has just published three manuals of what will be a series of 11 manuals, known collectively as the "Urban Subwatershed Restoration Manual Series." This series is being developed by CWP to organize the enormous amount of information needed to restore small urban watersheds into a format that can be easily accessed by watershed groups, municipal staff, environmental consultants and other users. Together, the USRM manuals introduce an integrated framework for urban watershed restoration, outline effective techniques for assessing urban watersheds, and provide a comprehensive review of watershed restoration techniques. Each manual is packed with color photos, graphics, and data, including detailed field methods, practice specifications, costs, applicability and tips on implementation. The manuals are approximately 100 pages long each; some also include a CD with software to facilitate data collection and storage.

The eleven manuals are:

1. An Integrated Framework to Restore Small Urban Watersheds
2. Methods to Develop Restoration Plans for Small Urban Watersheds
3. Storm Water Retrofit Practices
4. Stream Repair and Restoration Practices
5. Riparian Management Practices
6. Discharge Prevention Practices
7. Previous Area Management Practices
8. Pollution Source Control Practices
9. Municipal Practices and Programs
10. The Unified Stream Assessment: A User's Manual
11. The Unified Subwatershed and Site Reconnaissance: A User's Manual

Thanks to an EPA grant, you can download the first three manuals in this series (#1, #10, and #11) in PDF format FREE through October 2004. To download, simply visit the Center's Web site: www.cwp.org. Color hard copies are also available from the Center for a nominal charge. Five additional manuals are scheduled for release before the end of 2004, and the remaining three some time after that. For more information, contact the Center for Watershed Protection, 8390 Main Street, 2nd Fl. Ellicott City, MD 21043. Phone: 410-461-8323; e-mail: center@cwp.org.

Web Sites Worth a Bookmark

Agriculture Ecosystems Research Group

www.uwex.edu/ces/forage/ageco.htm

This group, based out of the University of Wisconsin-Madison, brings together researchers and farmers from across Wisconsin to collaborate on research projects. The group focuses on identifying crops and agricultural practices that will economically benefit farmers while protecting environmental resources. Their Web site offers description of their ongoing research projects, and provides links to collaborators' Web sites.

Ramsar Video for World Wetlands Day

www.ramsar.org/wwd2004_index.htm#offer

Download materials including a leaflet, logos, poster, and video created to highlight the values and benefits of wetlands. The materials were developed as part of World Wetlands Day 2004 by the secretariat of the Ramsar convention, based in Switzerland. The 30-minute video highlights wetlands-related restoration projects around the world. E-mail ramsar@ramsar.org to request copies of materials.

Robocow

www.agr.gc.ca/pfra/flash/robocow/en/robocow_e.htm

This Web-based flash animation has made the rounds in various e-mail and electronic list-serve circles because of its attention-grabbing animation, and is well worth a mention here. Put together by the Prairie Farm Rehabilitation Administration of the Canadian Government's Agriculture and Agri-Food Ministry, these animations feature a new superhero, Robocow. Watch as Robocow flies over agricultural horizons, rescuing us from ill-advised practices that endanger the quality of surface waters. Conceived to make students from grades 6 to 10 aware of best farm management practices, Robocow has also been receiving rave reviews as a creative and informative outreach tool for the entire farming community.

Tools of Change

www.toolsofchange.com

"Tools of Change" is a Canada-based, bilingual Web site for those who plan and carry out programs to promote healthier or more environmentally sustainable actions and habits. Users have free access to case studies, planning guides, and worksheets to help them learn from collective experiences and create healthier, more sustainable communities. The site also offers links to resources on partners' Web sites. The site's primary sponsors include Health Canada, Environment Canada, Natural Resources Canada, and the Federation of Canadian Municipalities.

Smart Communities Network: Water Efficiency—Pollution Prevention

www.sustainable.doe.gov/efficiency/wpinfo.shtml

As part of the U.S. Department of Energy's Smart Communities Network, this site presents resources aimed at preventing water pollution and improving water efficiency. It includes a descriptive list of links to many on-line NPS pollution resources. This site also provides links to other water efficiency information, including success stories, example ordinances, educational materials, and publications.

Tribes Water Quality Standards and Criteria

www.epa.gov/waterscience/tribes
This EPA site serves as the central location for disseminating all tribe-related water quality standards and criteria information. EPA designed the site to help carry out the Office of Water objectives to meet the goal of clean and safe water in Indian country.

Datebook

Meetings and Events

August 2004

5 — *"After the Storm"* polluted runoff education video available for free distribution to cable and other television stations (in high quality Beta SP format). Co-produced by the EPA and The Weather Channel. For more information, see www.epa.gov/weatherchannel.

16–20 — *World Water Week*, Stockholm, Sweden. For more information, visit the Web site: www.siwi.org/waterweek/.

September 2004

1 — *Public Meeting of the Mississippi River/Northern Gulf of Mexico Watershed Nutrient Task Force,* St. Paul, MN. More information is available at: www.epa.gov/msbasin.

12–15 — *Second National Conference on Coastal and Estuarine Habitat Restoration*, Seattle, WA. For more information, e-mail nmaylett@estuaries.org or visit the Web site: www.estuaries.org/2ndnationalconference.php.

12–15 — *Self-Sustaining Solutions for Streams, Wetlands, and Watersheds*, St. Paul, MN. For more information, visit the Web site: www.asae.org/meetings/streams2004.

12–17 — *Watershed Restoration Institute 2004.* Seattle, Washington. Hosted by the Center for Watershed Protection in partnership with the University of Washington and River Network. For further details, see www.cwp.org.

14–16 — *11th Annual Conference, Workshop and Trade Exposition*, Mid-Atlantic Chapter of the International Erosion Control Association. The theme of the conference: "NPDES: From Problems to Solutions." Martinsburg, WV. For more details, see www.macieca.org.

17 — *Conference on Watershed Conservation 2004: Water Resources, Ecosystems, and People.* University of Massachusetts, Amherst, MA. For more information, see http://madras.fnr.umass.edu/conference04/.

20–22 — *8th International Wild Trout Symposium*. Yellowstone Park, MT. For more information, visit the Web site: www.fedflyfishers.org/wildtrout8.

21-23 — *Putting the LID on Stormwater Management*, College Park, MD. Through a grant from the U.S. EPA, the Metropolitan Washington Council of Governments, Prince George's County, and the Anacostia Watershed Toxics Alliance are hosting the first-ever national low impact development (LID) conference. For more information, see www.mwcog.org/environment/LIDconference/.

20–24 — *Monitoring Science and Technology Symposium*. Denver, CO. For more information, visit the Web site: www.monitoringsymposium.com.

26–30 — *9th International Conference on Wetland Systems for Water Pollution Control*. Avignon, France. For more information, visit the Web site: http://iwa-ws.lyon.cemagref.fr/index.php?p_section=overview&p_lang=en.

26–30 — *12th National Nonpoint Source Monitoring Workshop: Managing Nutrient Inputs and Exports in the Rural Landscape*. Ocean City, MD. For more information, visit the Web site: www.ctic.purdue.edu/NPSWorkshop/NPSWorkshop.html.

Contribute to Nonpoint Source News-Notes

Do you have an article or idea to share? Want to ask a question or need more information? Please contact NPS News-Notes, c/o Tetra Tech (EPA Contractor), by mail at 10306 Eaton Place, Suite 340, Fairfax, VA 22030, by phone at 703-385-6000, or by e-mail at kathryn.phillips@tetratech-ffx.com or melissa.desantis@tetratech-ffx.com.

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