The editor and staff of *News-Notes* offer condolences to those affected by the tragic events of September 11, 2001.

January 2002
#67

Nonpoint Source News-Notes

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

EPA Works to Safeguard the Environment From Terrorism

As the events of September 11 continue to reverberate in all our lives, EPA is quickly moving to prevent terrorist acts involving water and other environmental resources. The next issue of *News-Notes* will carry a complete story on EPA's anti-terrorism program.

Commentary

Protecting Our Water Resources Through Better Development Practices

by Chuck Suftin, Director, EPA Assessment and Watershed Protection Division

America's landscapes are rapidly being transformed by the process of urbanization. A growing U.S. population and its changing distribution have increased the need for housing and infrastructure such as roads and sewage treatment plants. Farmland, forests, and wetlands in these developing areas are being converted to residential and commercial developments. In our inner cities, brownfields and other areas lay vacant, while farmland and open space is consumed in metropolitan edge areas. These factors, added together, contribute to a decrease in regional water quality.

These changing land uses impact our water resources. The lack of adequate planning, coordination, and management have resulted in the degradation of our waterbodies and the destruction of wildlife habitat. Valuable open space needed to filter and infiltrate runoff and recharge aquifers is being paved or turned into impervious surfaces. This added impervious surface increases runoff that may increase erosion and flooding. More intense land use also typically generates significant pollutant

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Protecting Our Water Resources Through Better Development Practices (continued)

loadings even when best management practices are used. State 303(d) lists contain numerous waterbodies affected by urbanization and reflect increased recognition that the designated uses of many waterbodies cannot be achieved without incorporating specific low impact development practices that will reduce storm water runoff and the associated pollutant load. In this way, communities can continue to grow without further degrading their waterbodies; and in some cases, will be able to grow while contributing to watershed restoration efforts.

Fortunately, this dilemma can be solved. States and local governments are leading the way in identifying and testing alternatives to traditional development methods that better protect water quality and wildlife habitat. This issue of *Nonpoint Source News-Notes* contains articles and examples of how selected communities, local governments, and environmental groups are pursuing better development strategies (see page 12).

With thoughtful planning, design and construction, development can serve the economy, the community, and the environment. We must change the development debate from the traditional growth/no-growth question to "how and where should new development be accommodated?" By applying a comprehensive water resource planning approach and better design to new development in greenfields, brownfields redevelopment, and infill development, communities can continue to grow while protecting their water resources. Smart growth practices for water include cluster development (increasing density to preserve open space), narrow streets, vegetated buffer strips, numerous transportation options, and mixed-use development.

EPA recognizes that communities are searching for technical expertise and tools necessary to understand and manage the dynamics of growth. In my opinion, EPA has a role in helping communities make informed decisions based on sound science. My office has invested in the development of guidance and tools to help states and local governments monitor and assess their water resources, develop and implement appropriate goals, and evaluate whether these goals are being achieved. I believe that, at all levels of government and including the community, a systematic approach to managing growth is needed to successfully develop our country in a way that does not impair future generations' use of our water resources.

To help communities learn more about their water resources, identify trends in water quality improvements or degradation, and assess the results of their management actions, EPA is improving and integrating our assessment, monitoring, and data management systems to make them more useful and accessible to the public. We are also working to integrate our point and nonpoint source programs and drinking source water protection programs to allow us to more easily evaluate our progress in meeting the goals of the Clean Water and Safe Drinking Water acts. We continue to work with industry, state and local governments, and nongovernmental organizations such as watershed groups to help create partnerships, provide resources and tools, and more effectively disseminate information to those who can make a difference.

I encourage you to share your successes so other communities can accelerate their learning curves. I also look forward to working with you on creating and promoting tools to protect and improve water quality through better development practices.

SPECIAL FOCUS: Land Use and Water Resources

Coffee Creek — A Place You Never Have to Leave

The American dream of owning a nice house with a spacious yard has transformed the countryside previously surrounding major metropolitan areas into miles of residential developments and strip malls. Urban sprawl has resulted in longer commutes for many Americans, more infrastructure, and pollution. The developers of Coffee Creek Center, a 640-acre community in Chesterton, Indiana, decided to meet the challenge of sprawl head on. Their new development includes an open residential community and commercial center, thereby offering nearby jobs and eliminating the need for long commutes. But what sets Coffee Creek Center apart from the rest is the one amenity that often draws people out of the city into the suburbs in the first place — open space and natural areas. By including a 180-acre watershed preserve in the community, the developers are protecting natural resources while offering potential buyers that little something extra.

Everything You Could Need — Close By!

Coffee Creek Center was designed with all the conveniences of modern society in mind. The commercial district offers a wide range of facilities, ranging from large corporate offices to small mixed-use areas that can serve office, retail, or living needs. Commercial buildings offer high-tech services, including fiber optic technology and proximity to a thriving retail district. Day care facilities, restaurants, health clubs, dry cleaners, and grocery stores are all located within easy walking distance of the corporate center. The proximity of these retail services eliminates the need for corporations to provide such services to their employees, giving them an edge over some urban corporations who provide these services to meet the needs of their employees.

The residential community of Coffee Creek Center is also a short walk or drive from the commercial center, eliminating the need for lengthy commutes. Narrower streets encourage slower traffic, giving the neighborhood a more laid-back feel. The residential center offers a wide variety of housing types, with "Village Homes," middle sized single family homes, the most common. "Estate Homes," large residences with wrap-around porches and spacious lots, are found at various locations throughout the development. Single family attached townhomes provide more economical living arrangements as does a neighborhood of paired and single family "Cottage Homes."

Coffee Creek has also created new ways to combine retail and residential communities. To accommodate the growing number of self-employed, part-time, and telecommuting workers, a wide variety of live-work facilities were included in the design of the center. These buildings, located near the commercial district, offer a range of designs, some resembling homes more than businesses and others vice versa. The key is flexibility in allowing both uses to exist under the same roof.

Nature is All Around

The developers also worked to protect and promote the environment. They used a combination of French drains, cisterns, native-planted swales, innovative planted parking lots, and other drainage features to encourage infiltration of storm water throughout the built environment. Most of the homes are built with porches that encourage residents to take advantage of the 200 acres of green space within the community. Parks are scattered throughout the community, giving all residents easy access to natural areas.

The focal point of the shared public space is the 180-acre Coffee Creek Watershed Preserve surrounding Coffee Creek, a tributary of Lake Michigan. Coffee Creek, named in the early 1800s after a caravan of wagons accidentally dropped a sack of coffee beans into the creek, winds through the development. The developers set aside this acreage to protect the creek and restore important natural ecosystems, including prairie, wetlands, and wet prairies, that existed prior to the settlement of the area. By doing so, they also provided opportunities for residents of their community and the general public to enjoy open spaces and recreation. More than five miles of trails wind through the Preserve, complemented by creek overlooks and boardwalks. The Preserve is also home to an amphitheater and a pavilion that are available for public and private events.

Although the Preserve is physically part of Coffee Creek Center, it is owned and managed by the Coffee Creek Watershed Conservancy, a nonprofit organization. Coffee Creek residents and the general public wishing to get involved in environmental projects can help the Conservancy to restore the Preserve's ecosystems, control invasive species, monitor the creek's water quality, and monitor wildlife.

Complementing the environmental efforts of the Conservancy, the Coffee Creek Neighborhood Association works to enhance the residents' sense of community. They offer opportunities for interaction through recreational leagues, cultural and educational programs, service clubs, senior citizen organizations, festivals and holiday celebrations, a community computer network, and a recycling program. Coffee Creek's design combines this community feel with the enjoyment of diverse open spaces to create an ideal lifestyle.

[For more information about the Coffee Creek Center neighborhood, contact Kevin Warren at the Lake Erie Land Company, 1010 Sand Creek Dr. South, Chesterton, IN 46304; Phone: (219) 395-5300. For more information on the Coffee Creek Watershed Preserve, call (219) 926-1842.]

Protecting Open Space and a Way of Life

Ever thought of building houses to prevent development? That's the solution offered by The Cholla Group, an Arizona company formed in 1997 by 14 investors seeking to preserve a large tract of ranchland located about an hour's drive east of Tucson. The Cholla Group is developing the Rancho La Joya Preserve as an active cattle ranch dedicated to raising organic beef; a recreational resource for horseback riding, birding enthusiasts, hikers, and mountain bikers; and a small community of 65 homesteaders who will live on and own the ranch in its entirety. Of the ranch's 36,000 acres, approximately 1,500 acres will be used for homesteads and recreational and ranching-related development; the rest will be committed to restoration, open space, and habitat and water quality protection. The overall goals of the ranch include improving habitat, protecting natural and scenic resources, restoring riparian areas and grasslands, and creating a residential community in which conservation and agriculture are compatible.

The Cholla Group partners, many of whom are planning to live on the preserve, see it as a way to outsmart inevitable growth. "We expect Tucson to keep growing. In the meantime, we are creating a small community of like-minded individuals who are interested in conservation and ranchland protection on a large scale," explains Gil Lusk, Managing Partner with The Cholla Group. "We'd like to show that development, ranching, and environmental protection are not mutually exclusive and can be profitable."

How Will It Work?

The Cholla Group is working closely with federal, state, and local organizations to develop the Rancho La Joya Conservation Plan (RCP) to guide the development and management of the ranch preserve. Although the specifics of the RCP are not yet complete, its three primary goals are already established:

Preservation: The RCP requires that about 34,500 acres, or 96 percent of the ranch, including the unique and valuable resources, be set aside as natural preserve lands to be retained in perpetuity for grazing, recreation, education, and resource conservation. These natural preserve lands include the riparian corridors, wetlands, sensitive species habitats, slopes in excess of 30 percent, highly scenic resources, and lands less accessible from existing roads.

In keeping with the ranch's conservation goals, the cattle operations will be managed so that both the cattle and the environment flourish. "We will operate a rotating pasture system so the cattle will be on a certain pasture only every 2 to 2.5 years," notes Lusk. "This will keep the cattle happy and restore the vegetation. Part of our goal at Rancho La Joya is to show that you can achieve a system that will support the agricultural family without destroying the environment."

Limited Settlement: The RCP allows approximately 1,500 acres to be carefully developed as homesteads, for limited uses including no more than 65 single-family residential units on 10 to 30 acres each and recreation areas and community centers, including the equestrian centers.

A Certain Future: The developers have arranged for all homestead owners to own, in addition to their parcel of land, an equal share of all the common property (ranch buildings, cattle, natural preserve lands, and recreational facilities). The developers created a for-profit company called the Rancho La Joya Corporation to manage the ranch operations for the shareholding owners of Rancho La Joya. Corporation staff will provide protection and security services; operate and maintain all business ventures on the ranch, including cattle operations and recreational casitas (guest houses); and maintain all community facilities, roads, water systems, and trails.

To ensure that 96 percent of the ranch preserve, including its most environmentally sensitive acres, remain natural and never subdivided, the developers also created a nonprofit organization called the Rancho La Joya Conservancy to hold all development rights and manage the natural resources.

Natural Resources Worth Protecting

The 36,000-acre Rancho La Joya Preserve is located in the Sonoran Desert from an elevation of 3,000 feet along the San Pedro River to about 6,000 feet at the base of the Rincon Mountains. Because of the diverse topography, the ranch supports numerous drainage outflows, springs, riparian areas, and unique ecological niches. The ranch occupies an important position in the Rincon Mountain ecosystem and contains numerous bird, wildlife, and plant species, including mule deer, javalina, fox, bobcat, panther, coyote, cacti, oak, sycamore, pine, manzanilla, cottonwood, saguaro, grasses, and more than 200 bird species.

Protecting Open Space and a Way of Life (continued)

The Conservancy will develop a yearly work plan that includes natural resource projects such as the installation of stream fencing, construction of storm water detention/aquifer recharge impoundments, and grassland restoration. The Conservancy's efforts are funded through an endowment established by The Cholla Group, LLC, using a dedicated portion ($20,000) of the sales price from each of the 65 homesteads. Because of its legal standing and permanent endowment funding, the Conservancy can protect the resources of the ranch preserve in perpetuity.

How Is This Financially Feasible?

The RCP allows for the sale of 65 homesteads, or residential lots — enough to create a community able to socially and financially sustain Rancho LaJoya for an indefinite period of time. The homesteads range in price from $250,000 to $550,000 and include an equal share of the Rancho La Joya Corporation. A small portion of the homestead purchase price is funneled into the Rancho La Joya Conservancy endowment; the rest is used to reimburse The Cholla Group for the cost of developing the project, including costs such as land purchase, carrying costs, road construction, wells and utility systems, construction of amenities (equestrian centers, pools, etc.), planning costs, and surveying costs. Any surplus funds will be used for cost overruns and profits for the 14 partners in The Cholla Group.

Once Rancho La Joya is developed and operational, any profit from yearly ranch operations and the recreational business (guest houses) will be reinvested in the continuing operations of the ranch. No profit or dividends will directly accrue to Corporation shareholders/homestead owners. Should owners sell their homestead, profits, reinvested in the ranch over the years, will be indirectly reflected in the pricing of the homestead and the increasing value of the underlying share of ranch ownership.

The Cholla Group developed the idea of the Rancho La Joya Preserve because they were concerned about the increasing breakup of family ranches, loss of ranch culture, and development of prime rangeland. Now, by showing that ranching, habitat protection, and people are not mutually exclusive, the Rancho La Joya Preserve can serve as a model for people concerned about preserving large tracts of undeveloped land anywhere in the country.

[For more information contact Gil Lusk, The Cholla Group, LLC, 3030 East River Road, Tucson, AZ 85718; Phone: (520) 529-3442; E-mail:hglusk@msn.com; Internet: www.rancholajoya.com.]

Chesapeake Bay Foundation Builds Environment-conscious Home

The mission of the Chesapeake Bay Foundation (CBF) is to improve and sustain the health of the Chesapeake Bay, North America's largest estuary, by reducing pollution and restoring habitat. In keeping with its goals, the CBF has based the design of its new headquarters in Annapolis, Maryland, on the principles of water resource protection through better development. CBF staff worked with architects from the SmithGroup (Bethesda, Maryland) to incorporate better building strategies such as energy efficiency, resource conservation, runoff prevention, and indoor air quality protection into the design of the new facility. Named the Philip Merrill Environmental Center in honor of a CBF trustee, the building fully complies with Maryland's legislation and is the only recipient of the U.S. Green Building Council's highest rating, Platinum, for Leadership in Energy and Environmental Design.

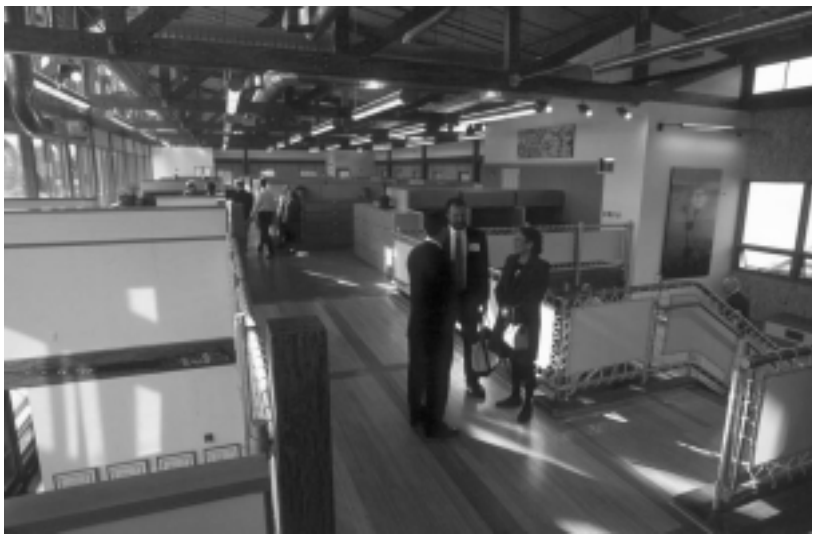
The building also serves as a very visible model for what can be accomplished in this type of development. Completed at a cost of $199 per square foot, the 32,000-square-foot building "is comparable in cost to a first class office building in this area — the type you'd see with walnut trim," explains Chuck Foster, Director of Fleet and Facilities for CBF. "Of course our building doesn't have that. We think we just spent our money more wisely."

Planning the Site

CBF chose to construct the new building on the footprint of an abandoned pool and poolhouse complex to avoid spoiling undeveloped land. Before construction of the new building, the abandoned buildings on site were deconstructed, and many of the materials were recycled. Avoiding the use of nonrenewable resources when at all possible, CBF used recycled and natural materials, as well as materials from regenerable resources, throughout the new building. A parking

lot was included under the new headquarters building, and additional parking areas were covered with gravel to create fewer impervious areas on site. CBF also installed a bioretention filter to treat oil and other pollutants in runoff from the parking areas and driveways.

CBF encourages its employees to use alternative transportation whenever possible. CBF included bicycle racks, showers, and changing facilities in the building to make biking a more convenient mode of transportation. Employees who use carpools are offered preferred parking and are enrolled in a program that guarantees them a ride home if they must miss their carpool.



The Merrill Center's open floor plan conserves energy. Environmentally-friendly construction materials, such as the recycled pipes used for handrails, conserve natural resources.

For work-related business, bicycles are available for local errands while two low-emission, hybrid gas/electric cars are available for longer trips. To reduce the need for staff to travel off-site for meals, CBF subsidizes a caterer daily to sell breakfast and lunch at cost. CBF also uses video and teleconferencing technology to reduce the need for its employees to travel.

Improving Energy Efficiency

CBF designed the building with many energy-saving features. Forty-eight geothermal wells were drilled 300 feet into the earth's surface where the temperature is a steady 58 degrees Fahrenheit year-round. The closed-loop system (no water is removed from the ground) uses heat exchange to help heat the building during the winter and cool it during the summer, allowing the building to rely less on traditional heating and cooling methods. Solar panels on the building's south wall generate electricity, and panels on the roof heat water, further reducing the need for a conventional hot water heater. High windows and the building's orientation toward the south take advantage of natural lighting and heating provided by the sun. Sensors and dimmer switches reduce electric lighting when sunlight is abundant. In addition, external sunshades reduce sunlight entering the building during the hot summer months. Finally, the building's walls and roof consist of insulated panels that decrease energy consumption. Thanks to these innovations, Foster estimates that CBF uses about two-thirds less energy than the average office building, thereby saving about $35,000 per year.

Conserving Resources

CBF emphasized resource conservation in every aspect of building construction. They used metal siding, roofing, ceiling tiles, particle board, and other construction materials that were recycled or created through processes that minimize damage to the environment. The wood for the external sunshades, for example, was recycled from old pickle barrels provided by an Eastern Shore pickle company that was going out of business.

For new flooring they used natural, renewable materials like cork, natural linoleum, and bamboo. CBF made an effort to buy locally produced materials to conserve resources and to decrease the impact of pollution caused by shipping. In fact, more than half of the construction materials came from within a 300-mile radius.

The Merrill Center uses very little water — only 10 percent of that used in a conventional office building. The building is equipped with a rainwater catchment system that uses barrels to store the water that runs off the roof. The stored water is routed to fire suppression systems, climate control systems, mop sinks, and laundry equipment. In addition, CBF installed waterless composting toilets that convert human waste into fertile garden topsoil over the course of three years. CBF has successfully used this type of toilet for the past 20 years in its educational facilities. To eliminate the need for outdoor watering, CBF is using native plants that are adapted to the local climate and can subsist on rainwater alone.

Chesapeake Bay Foundation Builds Environment-Conscious Home (continued)

Enhancing Indoor Air Quality

CBF recognizes that good air quality is essential for the health and happiness of its employees. To reduce exposure of employees to chemical vapors, only paints and adhesives containing no volatile organic compounds were used during the building's construction. In addition, operable windows allow for natural ventilation on days when the weather permits. To help ensure the windows are used, CBF installed an automated system that instructs employees to open their windows when temperature and humidity are acceptable. Aside from small soundproof meeting offices and storage rooms, the office space has no walls. This design allows for efficient ventilation and lighting. Rooms where chemicals, such as cleaning supplies, might be stored are directly vented to the outside to prevent circulation of the air through the building. Finally, CBF installed a carbon dioxide monitor in the main conference room that senses when the room is occupied and increases ventilation accordingly. This system saves energy by allowing the levels of ventilation in an empty room to be much lower.

Serving as a Model for Others

CBF staff moved into their new headquarters on December 8, 2000. The move was met with some mixed feelings. Most employees were excited about moving into the new building, although some were apprehensive about a building with an open floor plan and self-composting toilets. More than six months after moving into the building, however, everything seems to be going well. "Staff come to work earlier and stay later," comments Foster. "They seem to enjoy working in a building with so much natural light."

Assessing the Benefits of Effective Planning: Metro Square vs. Suburbia

Can the benefits of effective planning be measured? Yes, says an October 2000 exploratory study conducted by Criterion Planners of Portland, Oregon. The study, contracted by the Natural Resources Defense Council in cooperation with the U.S. Environmental Protection Agency, suggests that the environmental benefits of compact neighborhoods designed with thoughtful planning and water resource consideration are tangible and measurable. This study, unlike previous ones that were only model-based, is one of the first to examine a fully completed and occupied smart-growth style development, the Metro Square neighborhood. Located a mile from downtown Sacramento, California, Metro Square is a development of 46 single-family, detached homes built in 1998. Using a case study methodology, it was compared with two recent conventional suburban residential developments.

Titled *Environmental Characteristics of Smart Growth Neighborhoods: An Exploratory Case Study*, the study considered the impacts of the new-urbanism features included in Metro Square on four different areas—air, water, land, and energy use. Each topic area was considered in detail. For example, the study considered many water-related issues, including consumption, storm runoff, groundwater recharge, surface water quality, reuse, alternative supplies, and alternative waste treatments. The land issues assessed included agriculture/forestry, open space, sensitive lands, and adaptive reuse. Analysts looked at the corresponding impacts from the conventional suburban developments.

The study found several environmental benefits to the Metro Square neighborhood. Compared to the two conventional suburban developments with the same number of single-family homes, Metro Square consumes only about one-quarter as much land and, unlike the two conventional developments studied, no agricultural land was converted in its construction. Construction of Metro Square, built on existing vacant city lots, required no new infrastructure, whereas the suburban sites required a full complement of water, sewer, streets, drainage, and other improvements that represent enormous amounts of embodied energy and upstream pollutant emissions.

Despite its use of alleys and wide sidewalks, Metro Square contains less paved surface per household and per capita than the conventional developments, thereby reducing surface water runoff. Its more compact lots also reduce the need for pesticides and fertilizers, as well as water for irrigation during Sacramento's dry summers. Its households use about 20 to 30 percent less water than those in conventional developments, and more rainfall and other surface water is returned to ground aquifers because of the smaller amount of impervious surface per capita.

Water consumption at Metro Square could not be precisely quantified because Sacramento does not meter water use. However, the authors assumed that because the suburban yards were approximately six times larger than those of Metro Square, it could be reasonably expected that Metro Square households consume proportionately less irrigation water.

The study recommends that additional, more sophisticated research be conducted on more sites incorporating this design and location to help confirm that they are indeed more environmentally efficient. For example, the study suggests that a variety of conventional designs should be analyzed, including residential, commercial, and mixed-use projects of varying sizes. In the interests of quantifying water consumption, the study recommends installing water meters in the homes.

[For more information contact Kaid Benfield, Natural Resources Defense Council, 1200 New York Ave., NW, Suite 400, Washington, DC 20005; Phone: (202) 289-6868.]

Chesapeake Bay Foundation Builds Environment-Conscious Home (continued)

The building has received international attention. "We were not prepared for the interest that would be shown in our building. We've already had more than 1,000 visitors from around the nation, as well as from India, Germany, and Turkey." So many people want to see the building that CBF offers four organized tours each week, "plus a few impromptu tours as necessary," notes Foster. Thanks to CBF's efforts, a couple of new buildings in the area are incorporating green designs. "In fact, the state of Maryland is following what we did almost step-by-step for a new building at St. Mary's College," said Foster. Diverse organizations, ranging from state and federal government to nonprofit and for-profit groups, have expressed interest in emulating the CBF's designs and have contacted them for assistance. CBF hopes this is just the beginning of an expanded interest in better development practices.

[For more information contact Chuck Foster, Phillip Merrill Environmental Center, 6 Herndon Avenue, Annapolis, MD 21403; Phone: (410) 268-8816; E-mail: cfoster@savethebay.cbf.org; Internet: www.savethebay.cbf.org/merrillcenter.]

Land Use and Water Resources Publications Available from Scenic America

Scenic America is a nonprofit organization dedicated to helping local grassroots groups fight sprawl and apply land use and water resource strategies. The group recently published a series of nine fact sheets designed to inform local activists. Available for download, the fact sheets are:

- Conduct a Visual Assessment of Your Community
- Promote Good Design in Business and Historic Districts
- Encourage Attractive On-Premise Signs
- Fight Billboard Blight
- Protect Community Trees
- Locate Wireless Telecommunications Towers
- Sensitively Identify and Protect Scenic Vistas and Viewsheds
- Ensure a Strong State Scenic Byways Program
- Advocate for Context-Sensitive Highway Design

Scenic America offers a series of additional publications, including

Aesthetics, Community Character and the Law (2000). This document helps land-use planners and citizens understand the law of aesthetics and the legal tools available to help their communities maintain their special features and sense of place. (B37-Aesthetics: $34 each or five for $136)

O, Say Can You See: A Visual Awareness Tool Kit for Communities (1999). This document contains a collection of visual assessment exercises to teach readers how to get members of their community to assess local visual assets and think about how to preserve and enhance them. (B35-O,Say: $20 each or five for $80)

Saving America's Countryside: A Guide to Rural Conservation, 2nd edition(1997). This document offers case studies and practical tools to teach readers how to preserve community character. (B16-Rural: $25.95 each or five for $103.80)

[For more information, or to order documents, contact Scenic America, Inc., 801 Pennsylvania Ave., SE, Suite 300, Washington, DC 20003; Phone (202) 543-6200; Internet: www.scenic.org/growth.htm.

Low-Impact Development: A New Movement in Storm Water Management

Prince George's County, Maryland, a major metropolitan area outside Washington, D.C., developed Low-Impact Development (LID) in response to the limitations of conventional end-of-pipe storm water management controls. "We had one of the best and most progressive conventional storm water management programs in the United States," says Larry Coffman, director of the county's storm water management program. "What we found is that many of the techniques, such as ponds, were not showing significant improvements in water quality. In many instances they were contributing to the degradation of watersheds. For generations we were just removing storm water offsite from each development and translating problems downstream rather than using it is a resource that could be used to maintain the ecosystems in and around the site. We needed a new approach that addressed our water quality permit requirements, property owners' economic requirements, and our aquatic resource protection goals." It is from this "call to arms" that LID developed.

LID is based on maintaining or restoring the hydrologic integrity and functions of each site by using small-scale source controls that are designed to address specific water quality objectives.

Low-Impact Development: A New Movement in Storm Water Management (continued)

Prince George's County and the Low Impact Development Center, a nonprofit water resources research organization formed in 1998 in Beltsville, Maryland, have developed a guiding set of five principles for a comprehensive approach for new developments and retrofits of urban areas.

1. *Conservation of natural areas:* Preserving sensitive hydrologic areas such as riparian buffers and infiltrable soils.
2. *Minimize development impacts:* Use site planning techniques such as site fingerprinting or better site design to reduce hydrologic and hydraulic impacts.
3. *Maintain site runoff rate:* Use techniques such as surface roughness and increasing flow paths to maintain peak runoff rates.
4. *Integrated management practices (IMPs)*: Use LID source control techniques to meet volume control, filtering, or watershed timing goals.
5. *Public outreach and education:* Identify and distribute appropriate educational materials on construction and maintenance of IMPs.

Over the past few years, the LID Center has been concentrating on LID urban retrofits to meet long-term control plans for combined sewer overflow, total maximum daily load, and National Pollutant Discharge Elimination System permit requirements. The Center's staff have helped design pilot projects and assisted in the monitoring and construction of LID practices. Neil Weinstein, the Executive Director of the Center, comments on the Center's experience: "There are always lots of questions about short- and long-term costs, effectiveness, and maintenance. But what we have found is that through the construction, design, and monitoring of many of our pilot projects we are getting answers that our clients and regulators like. Before LID many of our clients were stuck and had few, if any, options using conventional techniques because of space limitations, costs, or maintenance. LID offers a tremendous number of options on construction, phasing, and funding that weren't possible under conventional approaches. Over the next several years I see lots more communities evaluating and incorporating LID into their storm water management programs."

LID is rapidly gaining acceptance throughout the country. The Puget Sound Water Quality Action Team is committed to getting the word out about LID. Members of the Washington-based team include a governor-appointed chair; the directors of 10 state agencies; a city and a county representative, and a representative of federally recognized tribes, each appointed by the governor; and nonvoting representatives of three federal agencies. In addition to organizing and cosponsoring a LID conference with the King County Department of Natural Resources in June 2001, the Puget Sound Water Quality Action Team also produces guidance material and encourages tribal and local governments, community groups, citizens, businesses, and state and federal agencies to incorporate LID methods wherever possible to protect the water quality and biological resources of the Sound.

In Minnesota, the Dakota Soil and Water Conservation District (SWCD) is using incentives to promote LID. Located just south of Minneapolis, Dakota County is experiencing tremendous urban development. Using set-aside funds and a substantial grant from the Metropolitan Council, the SWCD provides cost-share funds to support the design and installation of innovative source control stormwater management practices. "The LID cost-share grant is the best way for me to get in the door to talk to developers," says Jay Riggs, the SWCD's Urban Conservationist, "and if we don't end up with a project, I am still able to educate a critical player." In addition to providing cost-share monies, the technical advisory team for the Dakota LID Initiative has developed the LID Evaluation System (LIDES), a protocol for evaluating LID projects and determining cost-share eligibility. According to Riggs, "The LIDES is an important tool for us to determine which projects to fund and how much money they should receive." The last major component of the LID Initiative is education. The Dakota SWCD is targeting multiple audiences to receive the LID message: developers, design professionals, city staff, elected officials, and the public. "It is critical for us to establish demonstration projects to show that these techniques work in our climate," explains Brian Watson, the SWCD's manager. "We are taking a traditional SWCD program like cost-share and expanding it into the urban realm. These voluntary incentives have worked for us in the past, and we're confident they will effectively promote LID in our region."

Low-Impact Development: A New Movement in Storm Water Management (continued)

LID is proving to be an innovative technical approach to storm water management and environmental protection. With anchor points in Maryland, Washington, and Minnesota, the future of LID looks bright.

[For more information contact Neil Weinstein, Executive Director, LID Center, Inc., 7 Old Gate Court, Beltsville, MD 20852; Phone: (301) 982-5559; E-mail: nweinstein@lowimpactdevelopment.org; Internet: www.lowimpactdevelopment.org.]

Lending a Hand Long Distance

The Conservation Fund is going high-tech rather than heading for the highway. In June 2001 the Fund, a nonprofit conservation organization, held its first distance learning workshop, *Gateway Communities: Keys to Success*. The free workshop focused on gateway communities, which are towns and cities bordering America's national and state parks, wildlife refuges, forests, historic sites, wilderness areas, and other public lands. The workshop provided an overview of key issues that influence gateway communities and public lands, including growth, tourism, and transportation, and how to use a community's assets to preserve community character and the environment.

"Distance learning can reach a wider audience, provide a flexible learning environment, and bring together people from distant places to share knowledge and experience," explains Anne Desmarais, Sustainable Programs manager with the Conservation Fund. "The distance learning workshop provided an opportunity for a larger, nationwide audience to participate, whereas participation in on-site workshops tends to be limited to the local area. A majority of the participants in the distance learning workshop traveled less than 30 minutes to participate — most of these participated at their place of work. Distance learning is a powerful solution to provide quality, affordable education to working professionals."

The Fund offered the workshop through its Gateway Communities Leadership Program (GCLP), which seeks to build the capability of public land managers and gateway communities to collaboratively identify and address gateway and adjacent land issues through place-based partnership initiatives. Through the GCLP, the Fund develops education resources and offers training courses, workshops, and technical assistance to emerging and existing partnerships.

Long-Distance Logistics

The Fund conducted the workshop in partnership with the U.S. Department of the Interior's (DOI) Fish and Wildlife Service (FWS) National Conservation Training Center (NCTC), and with financial support from DOI's Bureau of Land Management (BLM). "Through our partnership with the DOI to develop and design collaborative learning and educational opportunities, BLM provided direct funding to help cover cost of design and delivery, and FWS provided distance learning staff and facilities to make the workshop possible," says Desmarais.

The three-hour workshop was broadcast over interactive satellite television (ITV), available in both digital and analog satellite formats. The ITV information was sent to registered downlink sites, which included federal agency facilities, local cable networks, and academic institutions. Course materials were provided for download on the NCTC web site. At each registered downlink site, a site coordinator was responsible for advertising the workshop locally, registering and preparing the site for the workshop, and disseminating workshop materials. During the workshop, participants relied on phone, fax, and e-mail to interact with participants from other gateway communities and with the workshop leader, Edward T. McMahon, Vice President of The Conservation Fund and a nationally known speaker on gateway communities and better development practices.

Drawing Participants Nationwide

The pilot offering of *Gateway Communities: Keys to Success* was an overwhelming success, drawing an unprecedented number of participants from communities and public agencies around the country. More than 290 documented individuals at 58 sites in 30 states participated, including public agency officials (68 percent), members of community organizations (11 percent), state/national nonprofit organizations (11 percent), and private sector employees (4 percent).

Participant feedback was provided through evaluation forms at each workshop site. "Participant responses were generally enthusiastic about the content and the format of the pilot ITV workshop,"

Lending a Hand Long Distance (continued)

notes Desmarais. "Based on these evaluations, future GCLP distance learning workshops will include increased opportunities for group discussion among participants at downlink sites, and between participants and the workshop presenters through e-mail, fax, and phone."

Pleased with the pilot program's success, The Conservation Fund will offer two additional distance learning workshops in winter 2001 and 2002. The Fund will broadcast a second offering of the introductory workshop *Gateway Communities: Keys to Success* on December 6, 2001, from 12:30 to 3 p.m. EST. In 2002 the Fund will also offer a new workshop, *Gateway Communities: Building Community and Public Lands Partnerships*, focusing on identifying issues and tools for successful gateway community/public land partnerships.

For more information about these workshops, or to register and participate in these events, please refer to the event announcement and links on the NCTC web site at http://training.fws.gov/dl/gatewaycommunities120601.htm. The Fund also offers a series of on-site and regional workshops addressing the needs of gateway communities. For more information see www.conservationfund.org.

[For more information contact Anne Desmarais, The Conservation Fund, 1800 North Kent Street, Suite 1120, Arlington, VA 22209-2156; Phone: (703) 525-6300; E-mail: adesmarais@conservationfund.org.]

Notes on the National Scene

Polls Reveal Continuing Misperceptions

Perceptions of who's responsible for water pollution haven't changed much in the past six years, according to polls conducted by three different organizations.

Only 15 percent of those polled recently by the National Geographic Society were aware that their own actions might affect rivers and watersheds, whereas a survey by the National Nonpoint Source Forum six years ago revealed that about 19 percent saw themselves as responsible for water pollution.

Both surveys found that people identify industry as the biggest polluter of our waterways: 44 percent in the National Geographic poll, 48 percent in the Forum survey.

A Roper poll for the National Environmental Education Training Foundation in 1999 confirmed this misperception of the major cause of water pollution. Less than half (47 percent) of the Americans Roper polled believed that runoff pollution is the biggest threat to water in their area.

The good news: Nearly one in five (20 percent) responding in the National Geographic poll support protecting and conserving rivers, although most said they didn't have much time and others said they lacked either information or awareness about the problem.

[For more information, contact Sarah Clark, The National Geographic Society; Phone: (202) 828-5664; E-mail: sclark@ngs.org.]

Success with Section 319 National Monitoring Program

Report Examines Section 319 National Monitoring Program

Since its inception in 1991 the Section 319 Nonpoint Source National Monitoring Program (NMP) has worked to improve water quality around the country. The many achievements of the NMP are noted in the November 2000 report *Section 319 Nonpoint Source National Monitoring Program Successes and Recommendations*, released by the North Carolina State University Biological and Agricultural Engineering Department's Water Quality Group (WQG). The report, available on-line at www.bae.ncsu.edu/programs/extension/wqg/section319/frontcover.html, explores the successes and lessons learned from NMP projects. It also offers recommendations to help improve state nonpoint source water quality programs and future NMP and other watershed projects. The report can also be obtained in hard copy by sending an e-mail request to wq_puborder@ncsu.edu.

What is the Nonpoint Source National Monitoring Program?

U.S. EPA, in cooperation with the states, developed the National Monitoring Program to improve the understanding of nonpoint source pollution and to scientifically evaluate the effectiveness of

Success with Section 319 National Monitoring Program (continued)

nonpoint source pollution control technologies. All NMP projects combine water quality monitoring with implementation of best management practices (BMPs). Typically, project staff monitor the baseline water quality conditions for at least two years, implement BMPs, and then monitor for an additional three to six years. The data from the pre- and post-BMP periods are then analyzed to evaluate whether water quality changes can be attributed to implementing BMPs.

To date EPA has approved 23 of 60 proposals. The funds EPA provides are used for monitoring and evaluation; funds for the technical and financial assistance related to land treatment implementation must be leveraged from other sources. Although most NMP projects have focused on agricultural sources, EPA is actively soliciting projects in other land uses such as forests and urban areas, as well as agriculture.

Learning from Successes and Failures

The report highlights the water quality concerns and the key successes and lessons learned for each of the 23 NMP projects. After reviewing the successful and unsuccessful project elements of each NMP project, the WQG developed a series of key recommendations to help improve the likelihood of future project success. Although these recommendations are targeted at NMP projects, they are applicable to any nonpoint source control project. "We can learn from past NMP watershed projects. One thing we have learned is that watershed projects should include a commitment to long-term monitoring if BMP effectiveness is to be established," explains Garry Grabow of the WQG. The report's recommendations are organized into four primary categories: Program and Project Organization and Administration, Effective Water Quality and Land Treatment Monitoring Strategies, Land Treatment Implementation, and Information and Education.

Program and Project Organization and Administration

Successful projects

- Clearly define roles and responsibilities of federal, state/regional, and local governments for effective interagency coordination and cooperation.
- Involve all major agencies and landowners in project selection and planning to maintain long-term commitments.
- Coordinate the efforts of water quality monitoring and land treatment implementation agencies and personnel.
- Ensure up-front commitment of funds for the multi-year project period.
- Attempt documentation at a statistical level of causes and effects.

Effective Water Quality and Land Treatment Monitoring Strategies

Successful projects

- Thoroughly document water quality problems (use impairment, pollutant(s) causing the problem, and critical pollutant areas) to allow development of realistic goals.
- Monitor, track, and document land treatment and land-use changes to help show their relationship to water quality improvements.
- Use multiple-watershed monitoring or an appropriate experimental design such as the paired watershed, monitored upstream/downstream before, during, and after land treatment.
- Conduct multiple years of pre- and post-BMP implementation monitoring to account for year-to-year variability and to increase the likelihood of documenting concrete water quality changes.
- Ensure that pollutants monitored correspond to pollutants being treated by BMP systems.
- Also, monitor explanatory variables to help adjust for major sources of variability other than BMPs.

Land Treatment Implementation

Successful projects

- Implement appropriate and sufficient BMPs to address the water quality problem. BMPs need to cause at least a 20 percent change in the water quality pollutant levels or loads before statistical linkages can be drawn.

Success with Section 319 National Monitoring Program (continued)

- Target BMP implementation to the critical pollutant source areas and pollutants, to reduce the delivery of the pollutants to the water quality resource of concern.
- Identify the parties responsible for operation and maintenance of both management and structural BMPs and make sure they follow through.
- Implement a system of BMPs. Multiple structural and management BMPs are usually necessary to best control the pollutant of concern.

Information and Education

Successful projects

- Provide education and outreach both before and during project implementation to ensure a high level of landowner participation, increase general awareness of the water quality problem, gain public support for the project, and improve landowners' understanding of their contributions to the problem.

To ensure continued funding of nonpoint source projects across the country, policy makers, politicians, government administrators, landowners, and taxpayers must have access to data showing that nonpoint source control technologies do work. Through its rigorous long-term monitoring requirements, the NMP is able to offer this data. By reviewing the NMP and suggesting ways to make it better, the WQG is helping to ensure continued monetary and political support for this program and other nonpoint source programs.

[For more information contact Garry Grabow, NCSU Water Quality Group, Biological and Agricultural Engineering Department, North Carolina Cooperative Extension Service, North Carolina State University, Campus Box 7637, Raleigh, NC 27695-7637; Phone: (919) 515-3723; E-mail: garry_grabow@ncsu.edu; Internet: www.bae.ncsu.edu/programs/extension/wqg.]

Section 319 National Monitoring Program Yields Results

by Steven A. Dressing, Environmental Consultant and Former Manager, U.S. EPA's National Monitoring Program

Low-cost riparian zone protection is a practical and cost-effective tool for reducing nonpoint source pollution concentrations and loads from livestock grazing lands. This finding and others from a section 319 National Monitoring Program (NMP) project in the northern end of the Lake Champlain Basin were reported by Don Meals of the Vermont Department of Environmental Conservation at the Ninth National Nonpoint Source Monitoring Workshop August 27–30 in Indianapolis, Indiana and cosponsored by the Conservation Technology Information Center, Purdue University, and U.S. EPA. Phosphorus, nitrogen, suspended solids, and indicator bacteria levels were all reduced in response to livestock exclusion and riparian zone protection implemented as part of this successful seven-year watershed project.

Begun in 1991 as a coordinated effort among U.S. EPA and other federal agencies, state and local government and groups, and academia, the NMP currently includes 23 watershed projects ranging from a small subwatershed assessment of the water quality benefits of innovative construction practices in Connecticut to a study of the effects of habitat restoration on stream temperatures and aquatic communities in the Upper Grande Ronde Basin of Oregon. NMP projects typically extend for 7 to 10 years and feature carefully crafted monitoring programs designed to measure the water quality benefits of improved land management measures. The results from the sustained efforts of the many hard-working people involved in these projects are beginning to roll in.

For example, improved grazing management, riparian fencing, and revegetation have reduced turbidity by half in one of the watersheds of the Morro Bay, California, project. In another West Coast project, rainbow trout are returning to a segment of McCoy Creek in Oregon, where riparian areas were revegetated and wet meadow conditions and stream meanders were restored.

Flood control structures, stream stabilization, and low stone weirs have reduced by 90 percent the sediment loading to Lake Pittsfield, Illinois, one of several NMP projects in the Midwest. Elsewhere in Illinois, biotechnical bank restoration and low stone weirs were used to increase biological diversity (as measured with the Index of Biotic Integrity) and increase fish populations in the urbanized Waukegan River watershed. In the Sycamore Creek watershed of Michigan, a

Success with Section 319 National Monitoring Program (continued)

combination of no-till farming and stream bank erosion control reduced sediment load by 57 percent in one treated subwatershed. Barnyard and streambank treatments at a dairy on Otter Creek in Wisconsin are responsible for major reductions in suspended solids, total phosphorus, ammonia nitrogen, BOD, and fecal coliform levels.

In the Long Creek watershed of southwestern North Carolina, livestock exclusion and riparian vegetation were successfully employed at a dairy to achieve significant reductions in fecal coliform levels and in sediment, phosphorus, and nitrogen loads. Monitoring in the Oak Creek, Arizona, NMP project contributed to a better understanding of the origin of fecal coliform loading in this highly valued recreational stream. Recreation areas were closed after related monitoring efforts in the watershed identified the agitation of contaminated sediment as a source of fecal material.

Future years will bring even more valuable information. All NMP projects include both water quality and land treatment monitoring across three project phases — before, during, and after implementation of control practices. The effectiveness of pollution control practices cannot be determined until all three phases have been completed. Several projects are still in the middle phase, and results from these will trickle in over the next several years. Some of the projects for which results are yet to come are the Lightwood Knot Creek project in Alabama, where sediment, nutrients, and bacteria from cropland and poultry operations are being addressed; the Jordan Cove project in Connecticut (construction); the Peacheater Creek project in Oklahoma (poultry, dairy, and beef); and the Swatara Creek project in Pennsylvania (coal mine drainage).

Some NMP projects are still analyzing their data to determine the effectiveness of control practices that were implemented. Sound statistical analysis is a cornerstone of the NMP program, and all projects have access to technical assistance from experts in the Water Quality Group at North Carolina State University (NCSU), as well as valuable assistance from their peers working on other NMP projects. NCSU is willing to work with potential projects in developing a monitoring approach that is suitable for inclusion in the NMP. Annual workshops, such as the one held recently in Indianapolis, bring NMP participants together with experts covering a range of disciplines, including water quality, statistics, land treatment, modeling, and sociology.

Although the current set of NMP projects will continue to add to our understanding of the causes of, impacts of, and controls for nonpoint source pollution at the watershed level for the next several years, NMP program leader Thomas Davenport of U.S. EPA's Region 5 office is always looking to enlist new projects.

[For more information contact Thomas Davenport, U.S. EPA Region 5 at (312) 886-0209, E-mail: davenport.thomas@epa.gov; or contact the staff at NCSU's Water Quality Group, Biological and Agricultural Engineering Department, North Carolina Cooperative Extension Service, North Carolina State University, Campus Box 7637, Raleigh, NC 27695-7637; Phone: (919) 515-3723; Internet: h2osparc.wq.ncsu.edu/319index.html.]

News from States, Tribes, and Localities

AMD&ART Helps Revitalize Streams and Communities

Schoolchildren in many areas of the Appalachian coal region draw landscapes using three basic colors: green for the grass, blue for the sky, and orange for the streams. They have no fear of correction from their teacher because indeed many streams, or rather stream bottoms, are coated with a bright orange precipitate. This coating is caused by acid mine drainage (AMD), acidic water that emerges from abandoned mining tunnels and contains high levels of dissolved iron, aluminum, sulfates, and other minerals. The effects of AMD are devastating to the aquatic environment. It changes the natural water chemistry; kills insects, crayfish, fish, and other forms of life; destroys habitat; and ruins recreational opportunities for visitors and residents alike. AMD problems, combined with the economic devastation associated with the decline of the coal industry, present a cultural as well as an environmental challenge for people living in modern-day coal country.

AMD&ART is a nonprofit organization founded in 1994 to help meet this challenge. The goal of the organization is to combine innovative science, the art of landscape design, community history,

and citizen participation to create artful public places that integrate the treatment of AMD with opportunities for people to explore, learn, and recreate. Goals of an AMD&ART project include the following:

- ***Remediation.*** The primary goal is to restore AMD-polluted waters to a life-sustaining level. Abandoned mine lands are transformed into treatment systems and wetlands that help restore water quality. Clean water will sustain long-term environmental health and provide recreational and economic benefits that will improve the self-image and quality of life of affected communities.
- ***Community action.*** AMD&ART provides a forum for community discussion, planning, and action. Local residents take ownership of a project and actively work together to link regional history, public art, community activism, and remediation science. Relationships are also developed between communities and various state and national resource agencies.
- ***Experimental learning.*** AMD&ART sites provide an opportunity to learn about and experience an interdisciplinary approach to problem solving.
- ***Collaboration.*** Through AMD&ART, individuals, organizations, and agencies with various interests work together to bring ideas and solutions to AMD remediation.
- ***Sustainability.*** AMD&ART sites are designed to be sustained by local resources.
- ***National model.*** The community-based, interdisciplinary approaches used by AMD&ART can serve as a model for other communities with AMD or other environmental problems.

The AMD&ART initiative began with three sequential project sites east of Pittsburgh, Pennsylvania. The AMD&ART Vintondale site incorporates a popular hiking trail with an attractive series of ponds and a wetland that gradually remove AMD pollutants before allowing mine water to enter the South Branch of Blacklick Creek. Native plants, chosen for their color to reflect the increasing health of the water, transition from deep orange to silver-green alongside the system. The seven-acre wetland is designed for maximum habitat and educational possibilities. Markers planned for the trail will invoke memories of the past, when mines and coal plants supported the town.

The centerpiece of the AMD&ART Hughes Bore Hole site is an existing AMD discharge that emits 1,500 gallons of flow per minute and delivers four tons of dissolved metals per day to the Little Conemaugh River. Visually arresting, this bore hole discharge creates a stunning array of colors that ooze and creep downstream over an essentially lifeless landscape. Designing a passive AMD remediation system for this massive outflow will offer a unique opportunity to learn about large-scale restoration techniques in the future. The area around the bore discharge will remain essentially untouched except for the installation of boardwalks that mirror the pattern of abandoned mine tunnels hundreds of feet below.

The Dark Shade Creek Sub-Basin project is AMD&ART's largest-scale project — a 9-mile-long drainage network with a 35-square-mile watershed and more than 20 AMD discharges. Within the watershed is the sobering sight of a trout stream with clear running water merging with an orange, AMD-stricken waterway. Farther downstream, the Dark Shade Creek empties into the Stonycreek River, one of two rivers that flow through the city of Johnstown. As the Dark Shade Creek watershed is restored, water quality in the Stonycreek River will improve dramatically. The AMD&ART team will work with many communities in the watershed to create a network of effective projects that will cleanse the entire watershed, as well as provide a broad base of public involvement opportunities.

AMD&ART projects strive to incorporate a sense of place, economic revitalization, and a renewal of community spirit. Although developed for coal regions, this model can be universally applied to watersheds throughout the country for a number of pollution problems. This fresh approach offers the opportunity to achieve stronger communities along with a cleaner environment.

[For more information contact Shannon Peterson, Project Coordinator, AMD&ART, Inc., 411 Third Avenue, Johnstown, PA 15906; Phone: (814) 539-5357; E-mail: amdandart@amdandart.org; Internet: www.amdandart.org.]

Saving Water for the Future

This summer the Maryland Department of the Environment (MDE) launched a new water conservation initiative targeted at state facilities, water utilities, and citizens. The backbone of the initiative is an Executive Order issued by Maryland's then Governor Paris Glendening on May 24, 2001 requiring all state facilities to conduct water use audits and to take steps to reduce their water use in the buildings and on the landscape. Water utilities that exceed certain water use criteria are also required to implement water conservation plans. In addition, MDE is developing an outreach and education campaign to teach Maryland citizens the importance of water conservation. Similar to the way it responded to concerns about sprawl by quickly implementing better land use development programs, the state of Maryland is once again on the cutting edge of environmental issues, anticipating and addressing the issue of water supply before it grows out of control.

Why This Big Step?

The program is a direct result of the drought of 1999, which caused many Maryland municipalities to find it necessary to implement water use restrictions. At that time the governor formed two drought management task forces to determine how the state could prevent similar problems in the future, considering that the state's population is expected to grow while its water supply is not. The groups developed several recommendations for businesses and individuals that were subsequently incorporated into MDE's program. "It is habit to think that we have all the water we need," says Lyn Poorman of MDE. "By not taking our water supply for granted, we can be more resilient during times of drought." To set a good example for the residents of Maryland, the governor issued the Executive Order requiring mandatory state agency water conservation.

State Facilities

The order requires that each building owned, leased, or managed by the state reduce its total water use by 10 percent by 2010. To help achieve this goal, each state agency responsible for the lease or maintenance of a facility is required to designate a water conservation coordinator, who will lead an annual water use audit and coordinate the development of a water conservation plan. The annual audit will rely on the use of flowmeters or other methods to account for water use and demonstrate that the water use reduction goals are achieved. The audit will help the agency identify and select specific water conservation measures that need to be employed to improve water management and water use efficiency. Elements of a conservation plan will likely include the purchase of water-efficient plumbing fixtures and other products when new or replacement products are needed, detection and repair of leaks, implementation of wastewater reclamation and recycling of water for nonpotable applications, and installation of efficient landscape design and irrigation techniques to prevent runoff.

Water Utilities

To expand the water conservation effort, MDE is requiring 27 water utilities serving more than 10,000 people to conduct audits to evaluate the amount of residential water used per person. If water systems have a per capita residential usage that exceeds 100 gallons per day (all uses), they will be asked to develop and implement a water conservation plan. Plans could include components such as improving metering capabilities, repairing distribution systems, changing the way they bill their customers, and providing water conservation education and/or financial incentives for consumers to reduce their water use.

Citizen Education

To round out the water conservation effort, MDE is also educating the citizens, businesses, and industries that use the water. MDE's water conservation and drought management website (www.mde.state.md.us/waterconservation/water_conservation.html) provides a comprehensive list of ways these groups can reduce their water use. MDE is also relying on radio advertisements, brochures, and outreach booths at community events to spread the word. MDE plans to eventually develop water conservation curriculum for the public schools. "We are trying to get the message out that even though it seems like we have lots of water now, we need to conserve for the future," explained Poorman. "People need to understand that if we use less water, more will be available for infiltration to replenish the groundwater and surface water, the burden on the wastewater treatment plants will be lower, and there will be less opportunity for water pollution to occur."

Saving Water for the Future (continued)

Program Status

Water use audits were due from the state agencies and water utilities during late summer 2001. The corresponding water conservation plans were due by October 1. To help with implementation, the governor has provided MDE with two full-time positions — one person to help refine state agency and utility audits and water conservation plans and another to focus on education and outreach. Poorman expects the positions to be filled soon, which will allow the program's implementation rate to accelerate.

Even without the new positions in place, the education program is underway. The first radio ads promoting conservation were aired in September. A booth promoting MDE programs, including water conservation, has been featured at the state fair and community events. As Maryland's new water conservation program matures, it is sure to become a model for other Mid-Atlantic states that face the increasing water demands of a growing population.

[For more information contact the Water Supply Program at the Maryland Department of the Environment, 2500 Broening Highway, Baltimore, MD 21224; Phone: (410) 631-3702; E-mail: watersupply@mde.state.md.us.]

Ohio EPA's Water Resource Restoration Sponsor Program Creates a New Source of Funds for Steam Restoration

The Ohio Environmental Protection Agency (Ohio EPA) recently introduced a creative way for communities to fund stream and wetland restoration work in conjunction with improvements and repairs to wastewater collection systems and treatment plants. Traditionally, the state's Water Pollution Control Loan Funds (WPCLF) program has provided low-interest loans to municipalities for wastewater treatment projects. Under a new program called the Water Resource Restoration Sponsor Program (WRRSP), if the community adds an approved restoration project to its treatment works project, it can reduce the total amount of money owed to the WPCLF. This is accomplished by reducing the rate of the treatment works loan by 0.1 percent and applying the savings to the WRSSP project money.

A variety of restoration activities can qualify as a WRSSP project, including shoreline easement purchase and protection, restoration and protection of stream channels or wetlands, and planning costs associated with waterway restoration. The community has the option of either taking on the project itself or engaging the services of a land trust, park district, or other entity to complete the project. The Ohio EPA must approve all WRSSP projects, however. Notably, environmental projects required as a part of a negotiated fine or settlement for environmental violations are not eligible for funding under the program.

The city of Vermilion, located in north-central Ohio, was the first community to participate in the WRRSP. The city received a $1.66 million, low-interest, 20-year loan from the WPCLF to improve and repair the city's wastewater collection system and wastewater treatment plant. In addition, it developed a WRRSP project to provide funds to the Lorain County Metropolitan Park District to purchase, restore, and protect undeveloped property along the Vermilion River. This add-on reduced the interest rate, saving the city $1.18 million in interest payments over the life of the loan and freeing that money to be used for the restoration and enhancement of the river.

[For more information contact Bob Monsarrat, Ohio Environmental Protection Agency, Division of Environmental and Financial Assistance, P.O. Box 1049, Columbus, OH 43216-1049; Phone: (614) 644-3655.]

Storm Water Management in the District of Columbia

Storm water best management practices (BMPs) are getting a new lease on life, thanks to a new program developed by the District of Columbia. In 1988 the D.C. Department of Health launched a formal program providing for the installation of storm water management controls. This program required that a responsible party be designated and legally obligated to maintain the BMP before the Department approved its installation. Within a few years of launching the program, the District of Columbia had pioneered the use of underground sand filters to treat storm water runoff. The units are designed to capture and treat the first half-inch of runoff generated by a 15-year storm event.

Storm Water Management in the District of Columbia (continued)

Since 1988 more than 400 sand filters have been installed or approved for installation, typically to treat runoff from service stations and parking lots for commercial and residential areas.

Under the old program, BMPs were inspected after installation only if an emergency failure was reported or if a permit renewal required inspection. By the mid-1990s many units had ceased to function properly. Recognizing that proper sand filter operation and maintenance was critical to sound storm water management, and ultimately to water quality in the Anacostia and Potomac Rivers, the Department of Health resolved to formalize its storm water management facilities maintenance inspection program.

Maintenance Is the Best Medicine

In 1999, under Theodore J. Gordon, Chief Operating Officer, the Department of Health implemented a new formal maintenance inspection program that established the regulations, policies, and procedures needed to ensure maintenance of units that were not operating properly. Program authority was given to the Department of Health's Watershed Protection Division (WPD). To support the program, the Department of Health hired one full-time staff member in the WPD who is responsible for developing educational material, performing maintenance inspections, and enforcing the District of Columbia's storm water regulations. Since the program's inception, more than 230 storm water BMPs (98 of which were sand filters) have been inspected, approximately 80 of which needed maintenance service. Of those 80, 68 have received maintenance service and have been restored to good working condition. The remaining 12 are still in need of maintenance service and are subject to enforcement action.

The owners of failing sand filters have ample opportunity to address the problem before WPD implements enforcement measures. Once an inspection identifies that maintenance is needed, WPD issues a letter giving the responsible party 30 days to secure a contractor to fix the problem. If after that time no action has been taken, the owner receives a Notice of Violation, which provides an additional 15 days to secure a contractor. If the owner does not respond, they are subject to an initial $100 fine per problem (the owner is subject to multiple fines if the same system has multiple violations). The fine is due within 15 days. Continued non-compliance can result in a doubling of the fine and eventually a court appearance. "Because maintenance of these systems can be costly, owners think that it's more economical to pay fines, and are slow to act but ultimately they still have to service the storm water facility and end up spending more money and wasting a lot of everyone's time," explains Walter Caldwell, an Environmental Specialist with WPD.

Educating to Avoid Enforcement

In connection with the formal storm water BMP maintenance inspection program, WPD is making a concerted effort to notify BMP owners of program requirements and educate them about proper maintenance. Using a grant from EPA, together with matching funds from the Metropolitan Washington Council of Governments, the WPD has developed an instructional video illustrating sand filter maintenance. A study of sand filter residuals, designed to characterize residuals found in sand filters with various land uses, has also been performed. The video documents full restoration of a sand filter located in the parking lot of a property owned by the District of Columbia Housing Authority. It will be shown primarily to sand filter owners and maintenance contractors. The video reviews all the important elements of sand filter maintenance

[For more information or for copies of the video or guidebook, contact Walter Caldwell, District of Columbia Department of Health, Watershed Protection Division, 51 N Street, NE, Washington, DC 20002; Phone: (202) 535-2240; E-mail: walter.caldwell@dc.gov.]

Restoring New Mexico's Ponderosa Pine Forests: Restoring Clean Water

Ponderosa pine forests, or areas once supporting ponderosa pine forests, cover about 4.7 million acres in New Mexico. Changes in land use, as well as changes in fire control philosophies, have altered the natural state of these pine forests. Once shaped by natural, frequent ground fires, these forests are now susceptible to raging wildfires that leave the land scarred and blackened, opening the way for serious erosion and sedimentation in nearby waterways. In response, the New Mexico Surface Water Quality Bureau is working with the U.S. Forest Service and environmental organizations to implement a series of pine forest management techniques to reduce the likelihood of this pattern of wildfire and water quality degradation.

Ponderosa Pine Forests in the Past

Virtually all ponderosa pine forests were shaped by frequent ground fires until the late 19th century. Because of their frequency, the fires prevented a buildup of flammable vegetation. When fires burned, the lack of fuel kept the fire at a reduced intensity so the fire simply removed the brushy vegetation and grasses in the understory and did not harm the mature trees. Now, however, these forests are largely shaped by the absence of fire.

Scientists at Northern Arizona University's Laboratory of Tree-Ring Research have learned, by analyzing fire scars in old ponderosa pines across the Southwest, that fires burned every 2 to 10 years or so in ponderosa pine forest up until about 1900. At that time the Denver and Rio Grande Railroad and other railroads were built, connecting the region with distant mining districts and urban areas and providing markets for cattle, goats, and sheep. This led to more intense grazing in the ponderosa pine forest areas, which eliminated the understory and caused natural fires to cease.

With the adoption by the Forest Service of a grazing permit system at the turn of the century, passage of the Taylor Grazing Act in 1934, and other changes in range management, the grasses, herbs, and small trees necessary for ground fires returned to many areas. By that time, however, the Forest Service believed that all fires were bad for the forest and doused any fires that occurred. When the ground fires stopped burning, bushes and small trees kept growing. This vegetation now serves as a ladder, allowing fires to reach the tops (crowns) of the ponderosa pines, causing much more intense fires that destroy mature trees.

Links to Water Quality

Forest Service studies have shown that wildfires also negatively affect water quality. Intense wildfires cause a complete loss of vegetation, which leaves the soil exposed and allows a dramatic increase in runoff and erosion following precipitation events. For example, according to the Cerro Grande Fire Burned Area Emergency Rehabilitation report, a peak flow of 1,278 cubic feet per second (cfs) is expected in Pueblo Canyon at the Diamond Drive crossing in Los Alamos if a 25-year, 1-hour rain event (equivalent to 1.9 inches of rain in 1 hour) occurs. Before the Cerro Grande Fire, the same rain event would have resulted in a mere 9 cfs. Similarly, a maximum peak discharge in Frijoles Canyon on Bandelier National Monument was estimated at 3,030 cfs 1 year after the La Mesa Fire of 1977. Before the fire, the same event would have produced a peak discharge of approximately 19 cfs.

These floods impair the water quality of streams in the burned area's watershed. "We are concerned about the wildfires' lasting impact on water quality," explains Abe Franklin with the New Mexico Surface Water Quality Bureau. According to Franklin, the high water flushes the fish, invertebrates, and much of the riparian vegetation downstream. Flood flows also widen channels and deliver sediment downstream to other rivers or reservoirs. "These above-normal flows are expected for several years after a wildfire. The negative impacts resulting from the high water and erosion can linger longer, as the stream channel and riparian vegetation take time to become reestablished." In some cases, Franklin adds, the lack of wildfire can actually be bad for water quality — for example, when thickets of young trees keep cattle out of the forest and force them to seek forage in more sensitive areas, such as riparian zones.

Forest restoration can also cause an indirect benefit to water quality by reducing evapotranspiration, thus increasing the amount of water reaching a stream. In a study of a ponderosa pine thinning project in the Beaver Creek watershed of Arizona, after one-third of the basal area (the cross-sectional areas of the combined tree trunks) of pines was removed, the creek's water yield increased at least 15 percent. "Increased water quantity, if it doesn't come all at once, can translate to more dissolved oxygen, lower temperatures, and higher instream flow to support aquatic life where a stream might otherwise run dry," explained Franklin. The study also showed that the water yield gradually decreased to pretreatment levels during the 6 to 10 years period following the thinning, indicating that the forest would need to be thinned again to experience the water yield increase. Because thinned ponderosa pine forest can be inexpensively (and relatively safely) maintained with prescribed fire, this study supports the need to manage the forests with fire.

Restoring the Pines

The Bureau supports restoration of ponderosa pine ecosystems with technical assistance, as well as Clean Water Act section 319(h) funding, in cases where the restoration activity is conducted in part to protect or restore water quality. These funds have allowed agencies to thin and burn many acres of ponderosa pine forest. Prescribed burning without prior thinning is also possible if the weather is very wet and cool, but is less effective at opening up the understory or preventing intense wildfire during times that are not so wet and cool.

One of the Bureau's thinning projects, located in a ponderosa pine area called the Santa Barbara Allotment, is getting some help from The Conservation Fund, which holds the grazing lease for another Forest Service grazing allotment. The Fund has arranged for members of the Santa Barbara Grazing Association to temporarily graze their cows on the Fund's "Grass Bank" while the Santa Barbara Allotment is being thinned. The period of rest encourages the sparse grasses that persisted under the thick ponderosa pine canopy to multiply, providing better fuel for prescribed fires. The grass is regrowing more abundantly after the burns and will provide better range for the cows in the future.

The Bureau is also supporting the Upper Santa Fe River Watershed Restoration Project, which, if implemented as proposed, will thin approximately 2,570 acres (probably followed by prescribed burning) in the 17,384-acre watershed; another 4,700 acres will be burned under very specific prescription conditions without thinning. This project is planned largely to protect the watershed that provides 40 percent of Santa Fe's municipal water supply.

Clearly these projects alone and others like them cannot achieve all the ponderosa pine restoration that is needed in New Mexico. Even with new federal funding becoming available, it might be impractical to restore ponderosa pine forests with repeated mechanical thinning. "Over 100,000 acres per year would have to be thinned for 20 years to restore half of New Mexico's 4.7 million acres of ponderosa pine forest. And without adopting prescribed fire, the expense would have to be repeated, and some management objectives would not be attained," explained Franklin. Mechanical thinning tends to leave small trees in place. These small trees can quickly fill the understory, elevating fire danger again. Furthermore, current markets cannot absorb all of the low-value, small trees that might be produced from widespread thinning projects. Finally, without fire, effective nutrient release to the understory vegetation would not occur.

The Bureau recognizes that restoring ponderosa pine forests is a multifaceted effort. The Bureau and other organizations will need to educate the public regarding fire safety and the important role of fire in ponderosa pine ecosystems. "Most of the section 319 projects that the Bureau funds have a public outreach component," notes Franklin. "A number of local environmental groups are also implementing fire education programs." Managers of projects proposing prescribed burns will need to work closely with owners and managers of lands adjacent to the burn area to allay their fears of uncontrolled wildfire. Finally, the Bureau and other organizations need to conduct research to better understand the long-term succession of intensely or moderately burned ponderosa pine forest and to discover ways to reduce costs of mechanical thinning.

[For more information on the topic of ponderosa pine forest restoration efforts in New Mexico, call Abe Franklin, New Mexico Environment Department, Surface Water Quality Bureau, P.O. Box 26110, Santa Fe, NM 87502; Phone: (505) 827-2793; Fax: (505) 527-0160; E-mail: abraham_franklin@nmenv.state.nm.us.]

Forest Waste Used as Furniture

The September 2001 issue of The Nature Conservancy's magazine includes an article detailing one way people can use the logs removed during the thinning of a ponderosa pine forest—as furniture material. The New Mexico Chapter of The Nature Conservancy secured pine logs for furniture for its Bear Mountain Lodge, located in the Gila National Forest near Silver City, New Mexico. Almost all of the lodge's furniture, including headboards, armoires, tables, and chairs, was made locally out of trees that were cut as part of a nearby forest restoration project. The effort to build custom-made furniture for the lodge is part of the Jobs and Biodiversity Project, a Silver City-based coalition of community and environmental groups, that is developing ways to restore forests to healthy conditions while encouraging economic growth. The project is one of 12 national pilot programs funded by the Ford Foundation to explore turning forest resources into protected livelihoods.

Notes on Watershed Management

Infrequent Inspections May Lead to Greater Stream Pollution

Enforcement of control measures can be the key to erosion prevention, a new study shows. Drs. Seth Reice and Richard Andrews, professors at the University of North Carolina–Chapel Hill, conducted the study between 1996 and 2000 in a 16-county area in the central Piedmont region of North Carolina. The scientists sampled benthic macroinvertebrates, some of which are particularly sensitive to sediment loads, including mayflies, stoneflies, and caddisflies. They then compared that information to the strength of erosion control rules and the degree to which they are enforced. The stringency of the laws proved far less important than the strictness of enforcement. The scientists found that if enforcement is slack, many builders are less careful about implementing the necessary erosion control measures and water quality is degraded. If enforcement is strict and backed by meaningful penalties, builders conform to the rules and water quality is better.

Infrequent Inspections May Lead to Greater Stream Pollution (continued)

Funded by a $577,000 grant from the Science to Achieve Results (STAR) program (funded by EPA and the National Science Foundation), the project looks at sedimentation problems from a new angle. "Ours was the first investigation ever to look at the actual impact of developers and regulators on natural stream ecology in this way," explains Reice.

Water Quality and Erosion Control

The scientists collected macroinvertebrate samples at 18 construction sites before, during, and after each project. During-construction samples were taken only on days following heavy rainfalls (at least ½ inch). According to Reice, "This was a very complicated, detailed study, during which we sampled and identified more than 300,000 invertebrates." Their analysis showed the best water quality in Orange County, followed by Wake County, followed by a 16-county, 8,000-square-mile area known as District 4 of the North Carolina Division of Land Quality.

The researchers compared the sampling results with the results of a public policy analysis of erosion control rules and enforcement. The analysis, conducted by Andrews and Ph.D. student Joanne Carmin (now a faculty member at Virginia Polytechnic Institute), revealed that Orange County had the strongest erosion control rules and adequate staff to inspect and strictly enforce the rules. Wake County had less stringent rules than Orange County but also was well staffed and strictly enforced the rules. District 4, on the other hand, had the same relatively weak rules as Wake County but fewer enforcement staff per capita and was less able to enforce the rules.

"The problem for District 4 is that the inspectors, who are good people doing their best, can't possibly keep up. It's likely they can't visit a construction site more than once before it's completed," Reice says. "The bottom line is that problems lie not with the counties or where the streams are but with enforcement, which is just not good enough in most counties. Our data provide a powerful argument for hiring many more sedimentation inspectors for North Carolina."

[For more information, contact Dr. Seth Reice, University of North Carolina–Chapel Hill, Department of Biology, Coker Hall, Chapel Hill, NC 27599-3280; Phone: (919) 962-1375.]

Storm Water Retrofitting of Reservoirs Protects New York's Drinking Water

Controlling storm water entering New York's Kensico Reservoir is key to ensuring safe drinking water for some 9 million New Yorkers — half the population of the states — and is the linchpin of the Kensico Water Quality Protection Program.

New York City's drinking water supply system is one of the largest in the world, supplying around 1.33 billion gallons of potable water each day to the city and upstate communities. Kensico Reservoir, one of 19 in the city's 1,969-square-mile watershed, is particularly important because it is the final impoundment for 90 percent of New York City's unfiltered water supply before it enters the distribution system. To meet the federal Surface Water Treatment Rule and U.S. Environmental Protection Filtration Avoidance mandates, the New York City Department of Environmental Protection's (DEP) Bureau of Water Supply has developed a proactive $15 million program to manage and protect the Kensico Reservoir and its watershed.

The Kensico Reservoir Storm Water Management Program is designed to reduce fecal coliform bacteria and turbidity delivered to the reservoir by controlling and treating storm water. The first phases of the project — assessment of the watershed, site selection, and the screening and design of storm water control and treatment facilities — were completed in July 1998. Facility construction was completed this past summer. DEP has committed to monitoring and evaluating facility performance and maintaining the facilities.

Watershed Assessment

The 13-square-mile Kensico Reservoir watershed includes four suburban towns in Westchester County, New York, and a small portion of land in Fairfield County, Connecticut. To assess storm water pollutant loadings in the watershed, the reservoir basin's physical characteristics were inventoried and digitally mapped. The watershed's topography is hilly and rolling; more than two-thirds of it contains slopes greater than 8 percent. Almost a third of the land area is used as open space, approximately one-fifth is developed in low-density residential, and the remainder is primarily recreational open space, farmland, and commercial.

Impervious surface area in the reservoir's subbasins ranges from 4 percent in the Whippoorwill basin to 45 percent in the Malcolm Brook basin (which drains into the Catskill Upper Effluent Chamber which sends the water directly into the district system) and averages 19 percent. The greatest concern is runoff from developed land directly adjacent to the effluent chambers that convey drinking water to consumers.

A preliminary assessment concluded that 73 of the watershed's 148 drainage basins might contribute fecal coliform bacteria and suspended solids (which cause turbidity) to the reservoir. The assessment initially selected 19 of the 73 for stormwater remediation, using field observations and the following criteria:

- Proximity to reservoir effluent chambers
- Known or potential sources of pollutants
- Quality and quantity of storm water runoff
- Presence of wetlands
- Topography
- Property ownership
- Observed erosion

Conceptual designs were prepared for 88 storm water management facilities in the 19 drainage basins. The storm water management plan was then refined by applying the following criteria, in combination with field investigations, maintenance considerations, and physical site constraints:

1. Can the site and the facility reduce pollutant loads?
2. Does the facility minimize impact on environmental resources and improve water quality?
3. Does the existing condition warrant engineered improvements?
4. Are there property ownership/permission constraints that make implementation impractical or impossible?
5. Since the Final Environmental Impact Statement was issued, have any watershed and land use conditions or assumptions changed affecting the appropriateness of the facility and/or the site?
6. Are there likely to be permit or property ownership issues that will compromise the project?
7. Are the maintenance and/or operation requirements of the project so burdensome as to make it inappropriate?

The final plan targeted 57 storm water management facilities. Each design incorporated existing topography; avoided wetland encroachment; included landscaping, wetland plantings, and features to discourage waterfowl; and provided for long-term maintenance. Each facility was engineered to minimize environmental impact on and off the site, without sacrificing water quality — a crucial component of enlisting the support of the community, regulatory agencies, and private property owners.

Construction followed a prioritized schedule based on erosion potential, water quality benefits, proximity to the effluent chambers, and permitting and property owner constraints. Each facility began functioning upon completion, and monitoring started in spring 2000, using the water quality monitoring stations incorporated into each facility.

Advisory Group

An expert advisory panel of academic and government engineering and health professionals reviewed plans and facility designs for the highest-priority drainage basin, Malcolm Brook. The panel supported the project and offered comments that helped shape the designs and gain community support.

Gaining Community and Regulatory Support

Securing permission from 32 landowners to construct 18 facilities on their land was a challenging aspect of the project. DEP identified the owners of property where the facilities would be sited and launched an outreach campaign to explain the project and secure local support and legal permission to construct and maintain the facilities on private property. Sites located within the same basin were pursued where access to private property was denied.

Ultimately, 44 engineered facility designs were completed, including 10 extended detention basins, 14 segments of stream channel stabilization, 13 outlet stilling basins, 1 area of parking lot stabilization, and 1 sand filter system. Additional road stabilization and drainage improvements to reduce erosion were incorporated into the stilling and detention basins and sand filter designs. In-reservoir containment booms are also being installed to prevent, recover, and clean up hazardous discharges from 23 Interstate-684 storm water outfalls that discharge directly into the reservoir.

Initially, DEP briefed town supervisors, engineers, and planners. Once their support was obtained, DEP submitted applications for local permits and approvals. A similar process of pre-application meetings followed with federal and New York state permitting agencies. These meetings set the stage for the relationship among DEP, municipalities, and regulatory agencies, allowing them to comment on the preliminary designs and permit applications.

The Rest of the Plan

Other components of the Kensico watershed management plan include

- ***Sewer inspection and repair:*** New York City funded repairs by the Town of Mount Pleasant and Westchester County to 39 segments of the 95,000 feet of sewer line in the watershed.
- ***Storm water infrastructure inspection/sewer system disconnection:*** DEP is digitally mapping the storm sewer system in the Kensico watershed and will video-inspect it to locate illicit wastewater discharge connections.
- ***Waterfowl management:*** Through hazing, shoreline meadow management, egg addling, and physical barriers, the city has dramatically reduced the amount of bird waste that enters the reservoir. The program runs August 1 through March 31 each year and has eliminated the greatest source of fecal coliform bacteria to the Kensico.

Farmscapes Offer Biological Pest Control

Want to reduce pesticide use on your farm? Try using beneficial insects instead. This approach, coined "farmscaping," is explained in a report recently released by the Appropriate Technology Transfer for Rural Areas, a project operated by the National Center for Appropriate Technology. The report defines farmscaping as a whole-farm, ecological approach to pest management that relies on the use of hedgerows, certain plants, cover crops, and water reservoirs to attract and support populations of beneficial organisms such as insects, bats, and birds of prey.

According to the report, a farmer must consider many issues when developing a farmscaping plan:

1. Ecology of Pests and Beneficials
   - What are the most important (economically) pests that require management?
   - What are the most important predators and parasites of the pest? What are the primary food sources, habitat, and other ecological requirements of both pests and beneficials?

2. Timing
   - When do pest populations generally first appear, and when do these populations become economically damaging?
   - When do the most important predators and parasites of the pest appear?
   - When do food sources for beneficials first appear and how long do they last?
   - What native annuals and perennials can provide habitat?

3. Strategy Identification
   - How can you reduce pest habitat?
   - How can you augment beneficial habitat?
   - What trap crops are available (those planted specifically to be more attractive to the pest than is the crop to be harvested)?

4. Establishing Insect Populations
   - Where can you obtain seeds and plants?
   - What is the cost of ground preparation, planting, and maintenance (irrigation, weeding, etc.) for at least 1 year following establishment of perennials, plus the number of beneficial habitat plants needed per season?
   - What type of equipment will you need?

Detailed appendices offer information about various types and examples of successful farmscaping plans, plants that attract beneficial insects, types of pests and their predators, seed blends to attract beneficial insects, hedgerow establishment and maintenance budgets, and a sample flowering period table. The report is available for download at www.attra.org/attra-pub/farmscape.html or www.attra.org/attra-pub/farmscaping.pdf.

[For more information contact the Appropriate Technology Transfer for Rural Areas (ATTRA), P.O. Box 3657, Fayetteville, AR 72702; Phone: (800) 346-9140; Internet: www.attra.org.]

Storm Water Retrofitting of Reservoirs Protects New York's Drinking Water (continued)

- ***Turbidity curtain:*** A turbidity curtain installed at the mouth of Malcolm Brook in the southwest section of the Kensico Reservoir successfully directs turbidity and fecal coliform bacteria away from the Catskill Upper Effluent Chamber.
- ***Reservoir dredging:*** The channels leading to the reservoir's two effluent chambers were dredged in 1999 to eliminate the potential for accumulated sediments to be resuspended during storms and affect the quality of water entering the effluent chambers.
- ***Failing septic system detection and remediation:*** To promptly identify and remediate failing septic systems, DEP is conducting a house-to-house survey and routinely patrolling the watershed. Incorporating an aggressive public outreach campaign, designing the facilities to minimize site and resource disturbances, providing for proper long-term maintenance of storm water controls, and monitoring effectiveness were high priorities for DEP, which is now using Kensico's storm water management plan as a template for watershed projects in other urban areas.

[For more information, contact James D. Benson, Program Manager, New York City Department of Environmental Protection, 465 Columbus Avenue, Valhalla, NY 10595; Phone: (914) 742-2034; E-mail: BensonJ@water.dep.nyc.ny.us.]

2001 CF Industries National Watershed Award Winners Announced

Watershed groups based in Alaska, Idaho, Wisconsin, and Vermont received the 2001 CF Industries National Watershed Award for demonstrating effective nonregulatory approaches to improve water quality. Recipients are:

- ***Duck Creek Watershed Management Project,*** Juneau, Alaska, which has become a national demonstration site to display stream and wetland technology.
- ***Tri-State Water Quality Council,*** Sand Hill, Idaho, for protecting the Clark Ford-Pend Oreille Watershed.
- ***The Lake Champlain Water Basin Program,*** Grand Isle, Vermont, whose innovative initiatives have achieved a 38.8 metric ton reduction in phosphate runoff into the basin.
- ***Riverbend Conservancy,*** established by Alliant Energy of Madison, Wisconsin, which chose to establish preserves in southern Wisconsin instead of selling the land for development.

Three communities and one corporation are honored by CF Industries annually for innovative partnerships that balance a watershed's environmental and economic needs and use economic incentives, voluntary initiatives, and education in striving to improve water quality. The award was established in 1996 as an outgrowth of the National Forum on Nonpoint Source Pollution and is administered by The Conservation Fund.

[For more information, contact John Dewey, CF Industries, Phone: (847) 438-9500.]

Notes on Education

Hard Work and a Bit of Fame Help Clean Up Hawaii's Waters

Honolulu, Hawaii, is taking innovative steps to combat storm water pollution. According to EPA studies in the early 1990s, the biggest threat facing Hawaiian waters was nonpoint source pollution — the oils, pesticides, debris, and sediment carried by rainwater through stormdrains and discharged into the ocean. For the Hawaiian economy, which has always relied on clean beaches and clean water to attract tourists, this pollution could have spelled disaster. However, Honolulu's Mayor, Jeremy Harris, and his staff recognized the magnitude of the threat and began a storm water education program in 1995. Since then the program has continued to evolve and has been recognized nationally for its success.

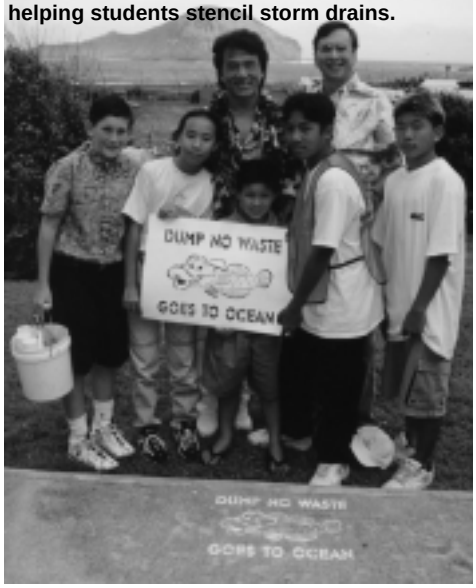
The Education Program

The goals of the education program are twofold: (1) to increase people's understanding of nonpoint source pollution so they change their behavior and business practices and (2) to build enduring, supportive relationships with community and environmental organizations. As a first step, Honolulu developed a series of public service announcements (PSAs). "The PSAs cover a variety of

subjects. Some focus on the streams and promote the Adopt-a-Stream program; others emphasize the message of the storm drain stenciling program. Most tell the story of how pollutants entering the storm drain system — through dumping oil, chemicals, and paint, using excess amounts of fertilizers and pesticides, and hosing down driveways — end up in the ocean," explains Robert Rock, Environmental Information Specialist with the City of Honolulu.

To gain public interest, the PSAs feature celebrities like Richard Chamberlain, the late John Denver, Jackie Chan, David Copperfield, Hawaiian star Jason Scott Lee, and local comedian Frank De Lima. "We are very proud of our PSAs," says Rock. "We have been able to get great talent at no cost to us. All of the celebrities have been very generous in donating their time to this worthwhile cause."

Actor Jackie Chan donated his time to promote the storm water program while helping students stencil storm drains.



The PSAs are aired during prime time so they can reach the most people. The prime time slots were made possible through an agreement with television stations to air one free prime time message for every paid prime time message. "Although we pay prime time rates for a prime time buy, we are actually getting a 50 percent discount since we get two-for-one during the same time period," explained Rock. The PSAs are aired twice a year for two to three weeks at a time, depending on the city's budget. "We also distribute new PSAs to the TV stations before we buy any air time," adds Rock. "Most stations do run them, which costs us nothing, so we get additional air time as a bonus. We then make our two-for-one buys about a month later."

The city's education effort also takes on other forms. City staff and volunteers stencil storm drains in neighborhoods and highly trafficked urban areas to communicate the message that pollutants entering storm drains end up in the ocean. Stencils in both English and Hawaiian add local relevance to the message. The city maintains a web site (www.cleanwaterhonolulu.com) where citizens and businesses can access information about storm water quality, ask questions, download regulations, and learn about volunteer opportunities. The city also spreads its message with bus posters, community event booth displays, banners, and give-aways like key chains and magnets.

Putting it Into Practice

Although making people aware of a problem is the first step, an education program is incomplete if people don't change their behavior as a result of the information provided. To encourage people to practice nonpoint source pollution prevention, the city works with community groups to encourage them to participate in preventive, corrective, and educational activities related to storm water. These include storm drain stenciling projects, educational material distribution, stream quality monitoring, and city cleanup days. The city also encourages citizens to take part in ongoing citywide programs such as Adopt-A-Stream, Adopt-A-Park, Adopt-A-Beach, Adopt-A-Block, and Clean-A-Reef. To show its support and appreciation to the participating groups, the city provides many of the project materials, such as gloves, bags, brooms, stencils, and paints.

The program, implemented under contract by a public education consultant, costs about $150,000 per year and is paid for through the city's operating budget. This cost does not account for the time provided by city staff in support of the program. The contract amount pays for the consultant's time, development and production of all public education materials, coordination and support of special events, and research.

Volunteer participation and a variety of donations contributed substantially to the success of the educational program and saved the city considerable cost. Donors included the television stations that donated air time and provided two-for-one purchases of television spots, celebrities who donated their time, companies that provided trucks and containers for tire and battery pickups, and companies that donated refreshments for volunteers and prizes for various programs.

Seeing Results

The education effort has made a remarkable difference around Honolulu. "Participation in the various adoption programs has left the parks and streams visibly cleaner," says Rock. "One group removed over 200 tons of pollution that would have ended up in the ocean."

Even those who do not participate in adoption programs are hearing the education messages. This past year the city conducted a telephone survey to measure awareness and the impact of the program. Of those contacted, 63 percent agree that major pollution of ocean and streams is caused by rainfall moving over and through the ground and carrying away pesticides, fertilizers, and other pollutants (up from 53 percent in 1995). The survey also showed that people are learning about many of the new programs: 78 percent have seen the storm drain stencils, and 45 percent have heard of the Adopt-A-Stream program. "We are extremely pleased with the high level of knowledge of the new programs since they did not previously exist," notes Rock.

Honolulu's successes are also being recognized locally and around the nation. The Hawaii chapter of the Public Relations Society of America awarded the public education campaign a Koa Anvil Award in 1996 for being the best public service campaign. The campaign also won Honolulu the Most Livable Cities Award at the 2001 U.S. Conference of Mayors. This competition included all kinds of programs — not just environmental programs — in other large cities across the nation.

[For more information, contact Robert R. Rock, Environmental Information Specialist, City and County of Honolulu, 650 South King Street, Honolulu, HI 96813; Phone: (808) 527-5699; E-mail: rrock@co.honolulu.hi.us; Internet: www.cleanwaterhonolulu.com.]

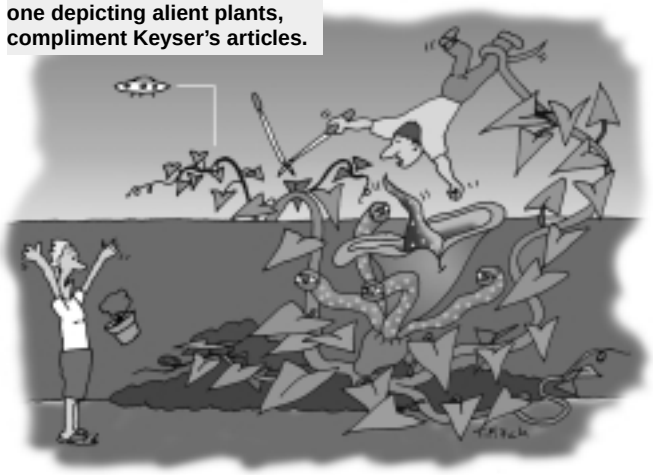
Montgomery County's Green Man Promotes Earth-friendly Landscaping

Alien Invaders in Your Yard and *Honey, I Shrunk the Lawn* are just two spine-tingling educational tales convincing homeowners to change their landscaping practices. The author, newspaper columnist Joe Keyser, writes a monthly column about environmentally friendly landscaping techniques for Montgomery County's *Gazette* and the Montgomery County Department of Environmental Protection (DEP) website (www.co.mo.md.us/services/dep/greenman/home.html). As the former program director for the American Horticulture Society and a contributing author for the Brooklyn Botanic Garden, Keyser has experience in landscaping and horticulture writing. Now, as DEP's Public Education Coordinator, he focuses his efforts on environmental education and outreach. He sees the column as an expedient and cost-effective way to help the public appreciate how landscaping can fit in with the natural ecology of the area.

Laugh and Learn

Keyser uses wit to keep readers entertained but gets his point across with startling facts and statistics. He has written many articles, more than 20 of which are available on the Internet, that explain topics such as edible landscaping, lawn care, landscaping wet and shady areas, using native plants, and using indoor plants to improve air quality. In an article entitled *Alien Invaders in Your Yard,* he warns about the dangers of invasive species and encourages homeowners to design gardens with native noninvasive species. As he explains it "Each year, exotic invasive plants like porcelain berry and English ivy take over an area eight times the size of Montgomery County, leading to billions of dollars in agricultural and forest product losses, and billions more in control costs. Your backyard may well represent a small but important skirmish in this chilling invasion scenario."

Clever cartoons, such as this one depicting alient plants, compliment Keyser's articles.



In *Honey, I Shrunk the Lawn* Keyser encourages homeowners to reduce the size of their lawns by using mulched planting beds and groundcovers. He quips, "Nothing is as satisfying as lawn care: coping with brown patch, powdery mildew, drought, rain, and weeds. In return, you enjoy the weekly mowing, noisy machinery, fumes, sweating, raking leaves, watering, and the cost of buying seed and fertilizer. Ah, it's the good life. Haven't you had enough? Maybe instead of just cutting your lawn, you should cut it down to size."

Making a Difference

Heeding his landscaping advice has not always been easy for residents of Montgomery County. Recently local citizen groups trying to implement Keyser's suggestion to replace grassy areas with native shrubs and wildflowers wound up in a legislative battle with Montgomery County's Permitting Office over regulations requiring that right-of-ways be planted with grass. However,

Montgomery County's Green Man Promotes Earth-friendly Landscaping (continued)

common sense prevailed. Once the county lawmakers learned of the benefits and beauty of native plants, they changed the county's requirements and now encourage planting right-of-ways with natives.

Keyser's writing has led to changes not only in public areas, but also in private residential landscapes. He routinely receives thank you letters from citizens and gardeners who comment that they have implemented his gardening ideas with success. *The Washington Post*, the *Gazette's* distributor, expects to expand the *Gazette's* circulation beyond its current Montgomery County edition readership of 1 million people. The expansion is expected to include the Southern Maryland, Frederick County, and Prince George's County editions. With this increase, Keyser expects that the influence of his articles will continue to grow.

[For more information contact Joe Keyser at the Montgomery County DEP, 225 Rockville Pike, Suite 120, Rockville, MD 20850; Phone: (240) 777-7720; E-mail: greenman@askdep.com; Internet: www.co.mo.md.us/services/dep/greenman/home.html.]

EnviroScape®Reaches 35,000 at Boy Scout Jamboree

Terrene Institute of Alexandria, Virginia, joined EPA's Office of Water in the official U.S. EPA tent at the Boy Scout Jamboree in July. The Jamboree, held over nine days at Fort A.P. Hill, Virginia, attracted some 35,000 Boy Scouts from all over the country. Terrene invited two college students from Fredericksburg, Adam Lincoln and Gretchen Kuhl, and staff from EnviroScape of Chantilly, Virginia, to help out at the tent. To accommodate the large crowd and continuous stream of visitors, two EnviroScape models were used, side by side — one showing the sources of water pollution and the other showing prevention practices in use. EPA and Terrene provided free handouts to the Boy Scouts as well. "This was an opportunity for college students to not only learn from teaching but also learn how to teach others while reaching a tremendous amount of our younger generation who are thirsty to learn how to better protect their environment," said Judy Taggart, Executive Vice President, Terrene Institute.

"It was a lot of work over nine days, but well worth the effort," said Erin Foster of EnviroScape, adding that "We all enjoyed the interaction with the Boy Scouts and others in the EPA tent."

[For more information contact Carlene Bahler, Terrene Institute, 4 Herbert Street, Alexandria, VA 22305; Phone: (703) 548-5473; E-mail: cbahler@erols.com.]

More Water Education Resources Available

Staff at the University of Wisconsin Cooperative Extension's Environmental Resources Center (ERC) recently developed a series of materials, *Educating Young People About Water*. The purpose of the resources is to help stakeholders develop a community-based water education program that targets youth and links key community members in partnerships—all working toward common water education goals. The resources available on-line (www.uwex.edu/erc/ywc/index.html), are the following:

Guide to Program Planning and Evaluation walks program planners through the steps in setting up and evaluating a youth water education program, including bringing together the key components that can lead to an effective program. (64 pages, $5)

A Guide to Unique Program Strategies tells the story of 37 program coordinators from around the country. Discover how they integrate community water education issues and youth development needs into unique program designs. (64 pages, $5)

A Guide to Goals and Resources, 2nd edition, provides the program coordinator with 100 water education curricula summaries, environmental education topics and goals, and multimedia resources. (59 pages, $5)

Planning for Fun and Success! is a video exploration of eight water education programs for youth. Program managers share their keys to success and the barriers they have overcome to keep their programs up and running. Divided into four training modules, this video illustrates concepts explored in workshops where participants learn to design a community-based youth water program. The video comes with a Program Leader Workshop Guide that explains how to conduct a workshop and use the materials in local planning sessions. (53 minutes, $10.95)

[For more information contact ERIC Clearinghouse, 1929 Kenny Road, Columbus, OH 43210-1080; Phone: (800) 276-0462; E-mail: ericse@osu.edu; Internet: www.uwex.edu/erc/eypaw.]

National Geographic Goes On-line to Teach About Rivers

Rivers get the spotlight in this year's National Geographic *Geography Action!,* an annual conservation and awareness program designed to educate and excite people about the world's natural, cultural, and historic treasures. This year *Geography Action! Rivers 2001* looks at how people and rivers are connected. *Geography Action!* starts each spring and culminates during Geography Awareness Week in November, when the results of how people took action will be posted on-line. The *Geography Action! Rivers 2001* website (www.nationalgeographic.com/geographyaction/index.html) offers information for students, teachers, and the public. Readers can visit a "Take Action!" activities menu on the web site or take an on-line survey about the types of river-related activities they participate in during the year. The website also contains a section just for K–12, an interactive river system, and supplementary educational materials for download.

Reviews and Announcements

Better Models for Development in Virginia

The Conservation Fund recently released a 108-page guide, *Better Models for Development in Virginia,* that explains how to create, maintain, and enhance livable communities in Virginia. Written for elected officials and interested citizens, the book sets out six principles and 25 key ideas for better development. Copies are $15 (plus $3 shipping and handling for the first book and $1 for each additional book). Contact the Conservation Fund at (703) 525-6300 or send a check directly to The Conservation Fund, 1800 North Kent Street, Suite 1120, Arlington, VA 22209-2156; Internet: www.conservationfund.org.

National Academy of Science's TMDL Report

In June 2001 the National Academy of Science's National Research Council released a report assessing the scientific basis of the Total Maximum Daily Load (TMDL) program. The report includes suggested steps that state agencies and EPA can take to improve the program. For a press release from the NAS see www.nationalacademies.org/news.nsf and select "June 15, 2001" in the news archives. Read the full text of *Assessing the TMDL Approach to Water Quality Management* for free on the National Academy's Press (NAP) web site (www.nap.edu/catalog/10146.html?onpi_newsdoc061501). Printed copies are available for purchase for $22.60 on-line from NAP or by calling (202) 334-3313 or (800) 624-6242.

Southern Sprawl Documentary

On June 20, 2001, the University of North Carolina at Wilmington aired its fourth television documentary, *Paving the American Dream: Southern Cities, Shores & Sprawl.* The documentary examines the factors that led to the explosive growth occurring along the eastern seaboard and offers some solutions to the problems caused by such growth. For more information, contact Elaine Penn at (910) 962-2657. A hard copy of the documentary ($22.95) can be ordered by calling (910) 962-2650.

As a supplement to the documentary, UNC Wilmington is developing an educators' resource web site, designed primarily for public schools. The site, due to be launched in fall 2001, will contain interdisciplinary activities that educate students about growth issues spanning various subjects from history to science, art to English. Many of the activities will be teacher- and classroom-driven; others will be designed for students to perform on their own. This site will also contain a section for environmentally concerned citizens and professionals. Finally, the site will list links to hundreds of other growth-related web sites.

A Watershed Decade

EPA's Office of Wetlands, Oceans and Watersheds recently released a report that details its activities over the past 10 years. This 34-page publication contains chapters on Aquatic Resources, Progress and Challenges, Meeting the Challenges, Partnerships, Global Activities, The Challenges Ahead, Regional Map, Organization Chart, and Finding OWOW on the Web. The publication is available for download at www.epa.gov/owow/home/accomplish.html. For more information or to receive a

copy, reference EPA 840-R-00-002 and contact the National Service Center for Environmental Publications (NSCEP); Phone: (513) 489-8190, (800) 490-9198; Internet: www.epa.gov/ncepihom/ordering.htm.

EPA Watershed Training Opportunities Booklet

In early 2001 EPA released the updated version of the *EPA Watershed Training Opportunities* booklet, which lists all watershed-related training courses offered either by or with funding support from the EPA Office of Water. The booklet contains a short description of each course and contact information. This booklet is also available on the Internet at www.epa.gov/owow/watershed/wacademy/its.html. To obtain a hard copy of this publication free of charge, reference EPA 841-B-01-002 and contact National Service Center for Environmental Publications (NSCEP); Phone: (513) 489-8190, (800) 490-9198; Internet: www.epa.gov/ncepihom/ordering.htm.

National Management Measures to Protect and Restore Wetlands and Riparian Areas for the Abatement of Nonpoint Source Pollution (draft)

This draft guidance is intended to provide technical assistance to state, local, and tribal program managers and others on the best available, economically achievable means of reducing nonpoint source pollution of surface and ground water through the protection and restoration of wetlands and riparian areas and implementation of vegetated treatment systems. Deadline for comments is February 4, 2002. Send comments to Christopher Solloway of EPA's Nonpoint Source Control Branch at solloway.chris@epa.gov.

Websites Worth a Bookmark

www.nationalgeographic.com/earthpulse/sprawl

The National Geographic Society's web site displays a series of images that explore the advantages and disadvantages of both New Urbanism developments, which feature intermingling homes, commercial businesses, parks, and schools, and suburban communities, which are dominated by single-family tracts, shopping malls, and office parks.

www.brook.edu/es/urban/publications/fulton.pdf

Who Sprawls Most? How Growth Patterns Differ Across the U.S., a report from the Brookings Institute examines the growth of urban communities in relation to population growth and the effects on public water and sewer systems.

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

This website, developed by the Nonpoint Source Capacity Building and Funding Work Group (a joint State-EPA workgroup), provides watershed groups and local governments links to technical tools for scientific support, engineering support, information technology, assistance with legal issues, project management, outreach, and planning support. It also provides links to legal resources for activities such as permitting, enforcement, contracting, fund raising, and resource management.

www.eelink.net

This environmental education web site offers a wide range of resources, including professional development information, classroom resources, environmental information and data, employment listings, and other resources. Although the site is geared toward environmental educators, it offers a great deal of useful information for the public.

www.waterwiser.org

WaterWiser is a program of the American Water Works Association operated in cooperation with the U.S. Bureau of Reclamation. It's a clearinghouse for information on water efficiency including books, calendar of events, links, references and products and services directories.

www.nal.usda.gov/wqic

The Water Quality Information Center at the National Agricultural Library (NAL) is part of the U.S. Department of Agriculture's (USDA) Agricultural Research Service. The center was established in 1990 to support USDA's coordinated plan to address water quality concerns. As the focal point of NAL's water quality efforts, the center collects, organizes, and communicates the scientific findings, educational methodologies, and public policy issues related to water quality and agriculture. The center's activities involve three areas: communications, library resources, and special projects.

www.watershedweekly.org

The Watershed Weekly site is primarily designed for Pennsylvania protection programs, but it also deals with watershed issues beyond the Pennsylvania borders. The website includes many special features including the weekly show, watershed heroes, resources, links and the Watershed Weekly newsletter.

www.stormwatercenter.net

The Stormwater Manager's Resource Center (SMRC) is designed specifically for storm water practitioners, local government officials and others that need technical assistance on storm water management issues. Created and maintained by the Center for Watershed Protection, the SMRC has everything you need to know about stormwater in a single site.

Datebook

DATEBOOK is prepared with the cooperation of our readers. If you would like a meeting or event placed in the DATEBOOK, contact the *NPS News-Notes* editors. Notices should be in our hands at least two months in advance to ensure timely publication.

Meetings and Events

January 2002

27–30 — *Water Reuse, Conservation, and Resources Management,* Las Vegas, NV. Contact Debby Qualls, Water Environment Federation, 6666 West Quincy Avenue, Denver, CO 80235. Phone: (303)347-6240; e-mail: dqualls@awwa.org; web site: www.awwa.org/02sources.

February 2002

25–March 1 — *International Erosion Control Association 33rd Annual Conference and Expo: Adventures in Erosion Education*, Orlando, FL. Contact IECA staff. Phone: (970) 879-3010; fax: (970) 879-8563; e-mail: ecinfo@ieca.org; web site: www.ieca.org.

27–March 1 — *5th National Mitigation Banking Conference: Moving Toward Solutions*, Washington, D.C. Contact the Terrene Institute, 4 Herbert Street, Alexandria, VA 22305. Phone: (800) 726-4853, (703) 548-5473; fax: (703) 548-6299; e-mail: terrinst@aol.com.

April 2002

10–11 — *4th Annual Washington State: Achieving Cleaner Water by Reducing Nonpoint Pollution*, Spokane, WA. Contact Washington Department of Ecology, Water Quality Program, P.O. Box 47600, Olympia, WA 98504-7600 or Gina Muldering, Conference Coordinator; Phone: (253) 843-9268; Fax: (253) 843-4949; E-mail: Mulderig@NWLink.com; Internet: www.ecy.wa.gov/programs/wq/nonpoint/conference/cleanerwater/

23–26 — *15th Annual Enhancing the States' Lake Management Programs: Managing Invasive Species in Lakes and Reservoirs*, Chicago, IL. Contact Bob Kirschner, Chicago Botanical Garden, 1000 Lake Cook Road, Glencoe, IL 60022; Phone: (847) 835-6837; E-mail: bkirschn@chicagobotanic.org.

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Nonpoint Source NEWS-NOTES is an occasional bulletin dealing with the condition of the water-related environment, the control of nonpoint sources of water pollution and the ecosystem-driven management and restoration of watersheds. NPS pollution comes from many sources and is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural pollutants and pollutants resulting from human activity, finally depositing them into lakes, rivers, wetlands, coastal waters, and ground water. NPS pollution is associated with land management practices involving agriculture, silviculture, mining, and urban runoff. Hydrologic modification is a form of NPS pollution which often adversely affects the biological integrity of surface waters.

Editorial contributions from our readers sharing knowledge, experiences and/or opinions are invited and welcomed. (Use the COUPON on page 31.) However, *NEWS-NOTES* cannot assume any responsibility for publication or nonpublication of unsolicited material nor for statements and opinions expressed by contributors. All material in *NEWS-NOTES* has been prepared by the staff unless otherwise attributed. For inquiries on editorial matters, call (703) 548-5473 or FAX (202) 260-1977.

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

NONPOINT SOURCE
News-Notes
c/o Terrene Institute
4 Herbert Street
Alexandria, VA 22305

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