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#53

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

Welcome to Our Urban Issue

This issue of *NPS News-Notes* focuses on NPS pollution from urban areas. Most of us live in urban areas, and we are, in many ways, the major contributors to NPS pollution. Our housing choices and transportation habits result in larger percentages of impervious cover and more polluted runoff. Both greatly degrade the water quality in urban streams, making it more unlikely that we can meet water quality standards, even with structural BMPs in place.

What can we do to save our urban streams?

Two commentaries provide different but complementary perspectives on the problem. The first looks at changing the face of future development by getting local officials and planners to reconsider ordinances that encourage impervious cover. This is followed by a philosophical reflection on the larger watershed and its hydrological and human aspects.

In the remainder of the issue, our contributors explore the urban landscape across America, examining urban stream restoration, urban forests, sprawl, and backyard conservation, to name a few topics.

If you have comments on this issue of *NPS News-Notes* or experiences you would like to share, please use the coupon at the back of the issue to contact us.

Inside the Urban Issue

Most issues of *News-Notes* are accessible on EPA's web site: www.epa.gov/owow/info/NewsNotes/index.html.

Commentary

Better Site Design: Changing the Rules to Protect the Environment

by Tom Schueler, Center for Watershed Protection

Few nonpoint source management practices can simultaneously reduce pollutant loads, conserve natural areas, save money, and increase property values. One might think that if such a "wonder practice" were ever developed, its use would spread across the nation. As it turns out, such a practice has existed for years: better site design. Despite its proven benefits, however, the use of better site design is often discouraged or even prohibited in many communities.

Better site design is a term that describes a fundamentally different approach to the design of residential and commercial development. The approach seeks to accomplish three goals at every development site: to reduce the amount of impervious cover, to increase the amount of land conserved, and to use pervious areas for more effective stormwater treatment. To do so, designers scrutinize every aspect of a site plan — streets, parking spaces, setbacks, lot sizes, driveways, and sidewalks — to see if they can be made smaller. At the same time, creative grading and drainage techniques are employed to prevent stormwater from concentrating into runoff. Lastly, land "saved" from being paved is then used to conserve forests and stream buffers.

When all of these techniques are applied together, the cumulative benefits can be impressive. For example, recent studies in Delaware, Maryland, and Virginia have demonstrated that better site designs can reduce impervious cover by 25 to 40 percent for a range of residential subdivisions. Other studies have shown that better site designs reduce impervious cover by about 20 percent in shopping centers and office parks. Less impervious cover translates directly into smaller pollutant loads. Recent studies have shown that better site designs produce 40 to 65 percent less phosphorus and nitrogen loads than conventional site designs — roughly the equivalent to what can be removed by a well-designed stormwater pond. The same studies have also documented that better site designs cost 5 to 20 percent less to build than conventional site designs.

In 1997, the Center for Watershed Protection convened a national site planning roundtable. Through the 18-month consensus-building process, a diverse cross-section of national planning, environmental, home builder, fire and safety, and public works organizations (as well as local planning officials) crafted 22 model development principles. Taken together, the principles can be applied to reduce impervious cover, conserve natural areas, and minimize stormwater pollution from new development, while at the same time maintaining quality of life for the residents.

The principles are presented in a consensus agreement entitled *Model Development Principles to Protect Our Streams, Lakes, and Wetlands* and a companion document, *Better Site Design — A Handbook for Changing the Development Rules in Your Community*. The handbook contains a codes and ordinances worksheet to help assess which local development rules can be changed to promote better site design. The worksheet guides local planners, subdivision plan reviewers, and planning boards through a complete assessment of local development standards and ordinances.

Why, then, is it so hard to actually implement better site design in so many communities? The major reason is the outdated development rules that collectively shape how development happens — the bewildering mix of subdivision codes, zoning regulations, parking and street standards, and other regulations. Few developers are willing to experiment with better site design as they are not inclined to invest in something that may not be approved.

A new movement may make it easier. Developers, water quality managers, and planners are reforming land development rules to permit better site development. Recently, transportation, public works, safety, planning, and engineering organizations that strongly influenced past development rules participated in a national site planning roundtable and developed a nationally accepted set of model principles that foster better site development. (The principles are on the Center for Watershed Protection's website: www.pipeline.com/~mrrunoff/.)

Changing local development rules is not easy. Progress towards better site development will require local governments to examine current practices in their communities and satisfy a broad range of concerns, such as how the changes will impact the cost of development, local liability, property values, public safety, and a host of other factors. Advocates of better site design are going to have to answer some hard questions from fire chiefs, lawyers, traffic engineers, developers, and many others in the community. Will the proposed changes make it more difficult to park? Lengthen response times for emergency vehicles? Heighten risks to the community's children? Increase the cost of development? Real

Better Site Design (continued)

change can happen only when these questions are thoroughly addressed and community concerns are fully satisfied.

Based on the principles resulting from the national roundtable, the Center for Watershed Protection has produced an approach for communities that want to change the way they are developing land. Known as a local site planning roundtable, the process can be long, arduous, and even contentious, but it can be a very wise investment, given the many economic, environmental, and quality of life benefits that it can produce.

[For more information, contact the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043. Phone: (410) 461-8323; fax (410) 461-8324; e-mail: mrrunoff@pipeline.com; web site: www.pipeline.com/~mrrunoff/.]

Stormwater Management: Recommendations and Advice (However Unsolicited)

by Earl Shaver, Technical Specialist, Auckland Regional Council

EDITOR'S NOTE: This commentary is based on Mr. Shaver's remarks earlier this year at a national conference, "Retrofit Opportunities for Water Resources Protection in Urban Environments."

Over the past 25 years, the goals of stormwater management have evolved, and expectations and responsibilities are now greater. The process has not been a smooth transition or integration.

Twenty years ago, we directed efforts towards water quantity issues such as downstream flood prevention and stream channel protection. Programs then evolved into consideration of water quality, essentially as an "add on," maintaining the program framework established for water quantity control. More recently, managers have focused on protection of downstream ecosystems. This change has fundamental implications for stormwater management program implementation and direction that differ from the historical approach. Consequently, we need to rethink all of our approaches to address ecosystem protection. We can't just use the ambulance at the bottom of the cliff (the traditional pond) if resource protection is now a program goal.

The new focus involves six basic changes in our approach.

The public wants clean water and healthy receiving systems but doesn't want to pay for them. We need to *personalize stormwater issues* so people understand why stormwater-related problems impact their quality of life and how their actions impact aquatic ecosystems. If people are not environmentally motivated, we need to make them aware of the economics of stormwater management. For example, the Auckland Regional Council estimates that the present benefits of clean water in Auckland waterways approximate $442 million per year.

Stormwater management also requires a *multidisciplinary team approach*, since it is no longer the sole province of engineers. Ecosystem protection goes beyond the expertise of most engineers. In fact, almost any professional— including ecologists, biologists, planners, and economists— could and should have input into the direction and implementation of stormwater management.

If our goals include protection of instream resources, we must provide *more aggressive protection of first and second order streams*. Seventy-two percent of all waterways in the United States are first or second order streams. We cannot hope to protect third order or larger streams if we allow enclosure, channelization, or destruction of first and second order ones. First order streams, perennial or ephemeral, are important resources and must be protected from mass grading. The historical approach has been to enclose them in pipes or channelize them in straight grass, concrete, or riprap channels with significantly reduced total length. Shortening due to enclosure or channelization increases slope and reduces energy dissipation, thereby increasing downstream channel scour potential.

A stream has an amount of energy to dissipate dependent on its elevation above sea level. When we shorten flow paths, we increase the slope of the stream, which increases the amount of energy that must be dissipated in a shorter length of stream than existed naturally. This, in

turn, increases a stream's erosion potential as it attempts to increase its overall length and dissipate erosive energy. In the end, overall stream health is reduced, and public cost to maintain streams in stable boundaries is increased. We must maintain existing flow paths, slopes, and timing of flows to streams if we want to protect stream health.

The volume of stormwater discharged is more important than has historically been recognized. A channel that had bankfull discharge once every year or two, now — with its drainage area fully developed — has bankfull discharges six to eight times a year. This increased number of bankfull flows increases stream channel erosion, both at the stream bottom and sides, and destroys habitat. We must *limit hydrologic change* in watersheds from site developments. Greater consideration must be given to what is done on the land. Our land use has to change to improve our efforts at resource protection and to protect against stream channel erosion.

Riparian buffer protection is also important. Providing water quality treatment for stormwater will not maintain or improve downstream ecology if we don't protect or restore suitable habitat adjacent to the stream for shading, food source, and channel protection. Wooded riparian buffers filter pollutants that pass through them as overland flow, act as a sponge for rainfall via the organic duff layer on the ground, use nutrients for growth, provide food and habitat in stream channels by providing organic material, reduce thermal impacts, and maintain stream dissolved oxygen levels. They also provide numerous other societal benefits that need to be recognized and communicated to the general public to get public buy-in.

Moving from the stream level to the program level, we *must work together and submerge our need for control and credit.* Egos are a real program implementation obstacle. Individual groups or governmental units are often at cross purposes. Due to the intense competition for funding, environmental improvement is often not as important as who gets credit for that improvement. Examples of this widespread problem abound; we all can detail some from our experiences.

Agency reorganization (i.e., change in leadership) seldom improves program implementation. Reorganizations should be based on improved communication or product delivery rather than on new leadership. Every time there is a change in agency leadership, the new leaders feel that agency structure must be based on a new vision. These reorganizations tend to result in greater levels of management with reduced resources available for actual resource protection.

Today's reality includes ineffective baseline controls, poor implementation, lack of land use control, and lack of political will and support. The desired fantasy is watershed-based approaches, ecological restoration, and swimmable and drinkable waters. Unfortunately, reality and fantasy seem to be growing farther apart. We need to get closer to the fantasy.

A reasonable analogy is the example of the Titanic. They say that "pride goeth before the fall," which certainly was the case of the Titanic. In reality, we are on our own "Titanic." We rely on technology and paper programs to save us and assume that tomorrow is the time to make the hard decisions. Only by making fundamental changes in our thinking and approaches related to resource protection now will we have a sustainable resource base tomorrow.

Please recognize that these comments represent the views of one individual — one who has been attacking windmills for most of his life. We have the knowledge of what we need to do, but can that knowledge be translated into improved environmental efforts?

Since moving to New Zealand, I've attempted to learn a different political system and to become part of a different culture. The indigenous people of New Zealand, the Maori, consider themselves Tangata Whenua (people of the land). A Maori philosophy says the following (loosely translated):

> *Now knowledge and wisdom are related but different in nature.*
> *Knowledge is a thing of the head, an accumulation of facts.*
> *Wisdom is a thing of the heart. It has its own thought processes.*
> *It is there that knowledge is integrated, for this is the center of one's being.*

We have to make stormwater management and resource protection a "thing of the heart."

[For more information, contact Earl Shaver, Technical Specialist — Stormwater and Sediment Control, Environment Division, Auckland Regional Council, BellSouth Centre, 21 Pitt Street, Private Bag 92 012, Auckland, New Zealand. Phone: 011 640 366 2000, ext. 8079; fax: 011 649 366 2155; e-mail: eshaver@arc.govt.nz.]

Notes on the National Scene

Brake Manufacturers Look at Pollution from Copper Brake Pads

Just when you thought carpooling, electric vehicles, and ethanol were beginning to make a dent in curbing pollution generated by cars, along comes another vehicle-related miscreant. This time it's copper. Not from vehicle exhaust, as you might expect, but from copper brake pads. The copper gets scraped off every time the brakes are applied and eventually is washed away by rain into roadside creeks.

Studies conducted by the Santa Clara Valley Nonpoint Source Pollution Control Program have shown that copper dust from copper-containing brake pads may be a large contributor to the elevated copper levels found in the southern portion of the San Francisco Bay. Copper is toxic to algae and other plankton at the bottom of the food chain, but its effects can also be seen in higher life-forms such as fish and shellfish.

In 1989, the California State Water Resources Control Board listed the South San Francisco Bay as an impaired water body because it periodically exceeds water quality criteria for nine heavy metals, including copper. Studies conducted thus far have been inconsistent. One study estimated that about half of the copper brake pad dust from cars in the bay area reaches the bay, contributing to 35 percent of the total amount of copper influx to the bay. Another study, conducted by Woodward-Clyde, suggests that copper dust from brake pad wear in the South Bay area may account for as much as 80 percent of the urban nonpoint source copper load.

To pinpoint just how much copper in the bay is from copper-containing brake pads, Common Ground for the Environment (an independent entity sponsored by Stanford University and the nonprofit organization Sustainable Conservation) formed a Brake Pad Work Group in October 1996. The work group is focusing on the San Francisco Bay and other copper-impaired water bodies nationwide.

The work group includes representatives from the auto manufacturing industry; brake pad manufacturing industry; storm water permitted facilities; environmental organizations; and federal, state, and local government agencies. The work group has met four times, focusing discussions on assessing brake pad contributions to copper levels in storm water, broadening representation on the work group, identifying the barriers to reducing the amount of copper in brake pads, and determining incentives to overcome those barriers. A six-member technical subcommittee, appointed by the group in early 1997, is working to identify scientific data gaps and to make recommendations for the development of adequate supporting data. The subcommittee is reviewing relevant studies and technical information on the fate and transport of copper, including data collected for EPA's national water quality database STORET. From STORET data, EPA has concluded that copper levels exceed National Toxics Rule levels in most estuaries and many inland watersheds and has declared the issue to be a frequently occurring local problem across the nation.

In a 1994 report entitled *Contribution of Heavy Metals to Storm Water From Automotive Disc Brake Pad Wear*, Woodward-Clyde Consultants report that General Motors, Ford, and Toyota cars driven in the San Francisco Bay area contribute less copper from their copper-containing brakes than cars manufactured by other companies. General Motors cars collectively contribute an average of 8 pounds of copper per year to the bay, Ford cars collectively contribute an average of 290 pounds per year, and Toyota cars collectively contribute an average of 435 pound per year. Brake pads on General Motors cars are less than 0.02 percent copper, while Ford brake pads range anywhere from 0.02 to 15 percent copper. Copper contributions from cars manufactured by other companies ranged from 937 to 3,549 pounds per year. Brake pads from these companies range from 12 to 22 percent copper. For a copy of the report, contact Kelly Moran, Santa Clara Valley Urban Runoff Program, City of Palo Alto Public Works Department, 2501 Embarcadero Way, Palo Alto, CA 94303. Phone: (415) 329-2598; e-mail: kelly_moran@city.palo-alto.ca.us.

Brake Manufacturers (continued)

Education Might Be the Answer

According to Kelly Moran, manager of Water Pollution Prevention for the City of Palo Alto and a member of the work group's technical subcommittee, the greatest accomplishment of the work group has been the education of brake pad manufacturers. The manufacturers are now seriously considering the impact of copper-containing brake pads on the environment. Moran explains that "many of the manufacturers hope that acting ahead of regulation will be in their own best interest, as well as in the interest of the environment, business, and government entities facing storm water requirements." Using less copper could also save the manufacturers money, considering that copper costs about $4 per pound.

"The work group members are very committed to finding out just how much of an impact copper-containing brake pads have on the bay," says Chris Elias, director of Environmental Programs for the Santa Clara Valley Manufacturing Group. Elias was asked to join the work group because of the critical role he has played in the past helping manufacturing groups to work together to achieve common goals on other issues.

Awareness is a key component in any environmental issue and is especially important here. Timothy Merkel, vice president of ABEX Friction Products in Winchester, Virginia, and a member of the Brake Pad Work Group, believes there has been a dramatic change in the way brake pad manufacturers think. "At first, everyone said their brake pads were not to blame, but, in the last year, we have all agreed to take a closer look at the exact fate of copper dust in the environment," reports Merkel.

A subset of the work group met in January to further discuss barriers and incentives identified by the larger group. Among the barriers to reducing the amount of copper in brake pads are cost restraints, timing, technological obstacles to reformulation of brake pad design, competitive issues, and the environmental effects of substitute products. Possible incentives include regulatory moratoria, governmental fleet preferences, marketing benefits, research funding for alternatives, and tax incentives.

Despite the fact that many manufacturers are skeptical that they can meet new motor vehicle safety standards that will be effective in the year 2000 without using copper, they are willing to reduce copper use if it can be proven that brake copper use has a significant impact on the environment. If a link between copper in brake pads and copper in surface waters is found, the work group may develop a partnership process to voluntarily reduce copper levels in brake pads. Many work group members believe that, given enough time, brakes can be redesigned to achieve safety standards without using copper, saving both money and the environment.

[For more information about the Brake Pad Work Group, contact Liz O'Brien, Common Ground for the Environment, c/o Sustainable Conservation, 45 Belden Place, 3rd Floor, San Francisco, CA 94104. Phone: (415) 288-0380; fax: (415) 288-0389; e-mail: suscon@igc.apc.org.]

Federal Advisory Committee Recommends Changes in TMDL Program

On July 28, the Federal Advisory Committee on the Clean Water Act's Total Maximum Daily Load (TMDL) program sent a report to EPA's administrator with 170 recommendations for improving the program. The recommendations, generally representing broad agreement across the 20-member committee, suggest new policy directions in some areas, while endorsing approaches consistent with the current program in other areas. Currently, EPA is considering the committee's consensus recommendations and is developing proposed revisions to existing TMDL regulations and guidance.

The TMDL program focuses on identifying and restoring the nation's polluted waterbodies, ensuring that they attain and maintain water quality standards. Under the program, states must identify and list waterbodies where state water quality standards are not being met and then must establish TMDLs for these waters.

A TMDL is a quantitative assessment of water quality problems and contributing pollutants. It specifies the amount of pollutant allowed while still meeting water quality standards, allocates pollutant load reductions among pollutant sources in a watershed, and provides the basis for taking actions needed to restore a waterbody through point source and nonpoint source controls.

TMDL Program Changes (continued)

The TMDL Advisory Committee, convened by EPA in 1996, represents diverse geographic, policy, and professional perspectives, including state and local governments, tribes, environmental groups, industry, agriculture, forestry, academia, and three federal agencies. A fact sheet and the full report (EPA 100-R-98-006) are available on the Internet at: www.epa.gov/owow/tmdl/advisory.html or by calling NCEPI at 1-800-490-9198.

News From the States, Tribes, and Localities

The Ocean State Makes Boaters Clean Up Their Act

Rhode Island, aptly nicknamed "The Ocean State," has become the first state in the nation to have a no-discharge area designated for all of its coastal waters. The area extends three miles offshore and includes a three-mile ring around Block Island. Rhode Island petitioned EPA to declare its marine waters a no-discharge area in September of 1997. The designation was approved on Monday, August 10, by EPA Region 1 Administrator John P. DeVillars, making Narragansett Bay the nation's first estuary to be declared a no-discharge area. (Fourteen states, including Rhode Island, already have no-discharge areas designated in many of their freshwater lakes and rivers.)

EPA labeled Narragansett Bay as an "estuary of national significance" in 1985, thereby inducting it into the National Estuary Program (NEP). Under the requirements of the program, Narragansett Bay NEP staff and other key stakeholders began developing a Comprehensive Conservation and Management Plan (CCMP) for the estuary. The 1992 plan recommended a no-discharge designation for Rhode Island's coastal waters. Anticipating the no-charge designation, scientists at the Rhode Island Department of Environmental Management (RIDEM) have been working with the U.S. Fish and Wildlife Service and marina owners for five years to set up sewage pumpout stations at marinas throughout the state so that boaters would have an alternative to emptying their holding tanks in the bay.

Potty Talk

Considering that, on average, 25 percent of the total fecal mass produced by one person is bacteria, it is easy to understand why boat waste can be a significant threat to water quality. A single bacterium can increase to more than 10 million organisms in 12 to 18 hours. Filter-feeding organisms like oysters, clams, and mussels absorb the bacteria, resulting in shellfish bed contamination and ensuing closures. Not surprisingly, high levels of fecal coliform bacteria are most evident in areas with a high boat concentration.

Three types of toilet systems are used to handle boat waste. Type I marine sanitation devices (MSDs) chop up and disinfect toilet wastes before discharging them into the water. They release effluent with fecal coliform counts of 1,000 organisms per 100 milliliters or less. Type II MSDs also reduce fecal coliform counts by disinfecting the waste, but they consist of a more advanced treatment system that drastically lowers the fecal coliform count to 200 organisms per 100 milliliters or less. Type III MSDs collect wastes in holding tanks that are designed to prevent the overboard discharge of any sewage, treated or untreated. Under the new no-discharge designation, any boats using Type I or Type II MSDs won't be allowed to discharge in the waters of Narragansett Bay.

Source: *Clean Water Notebook.* Vols. 1 and 2. Published by SeaLand Technology, Inc., 1995.

Currently, RIDEM has registered more than 31,000 boats, 27,600 of which are recreational. RIDEM estimates that only 16,000 boaters have the proper equipment to use pumpout stations. Forty-three pumpout stations at marinas and yacht clubs are available throughout Rhode Island. The waste collected at the pumpout facilities is usually piped to local wastewater treatment plants. The pumpout stations are paid for primarily by a grant from the Clean Vessel Act, which is funded nationwide by the U.S. Fish and Wildlife Service. This grant covers about 75 percent of the cost. The other 25 percent is paid by the grant recipient. The most a boater will have to pay to pump out sewage is $5, which is very low indeed when compared to fines of up to $500 for illegally dumping sewage once, or $1,000 for any offense thereafter.

Curt Schmid of Ram Point Marina has had the only pumpout station in South Kingstown for the last four years. It was installed by the town of South Kingstown, from whom Schmid leases the land for his marina. Ram Point keeps a log of the pumpout users and how often they pump out. Last season, nearly 300 boaters used the pumpout station at one time or another. Schmid says the pumpout station has increased his business dramatically. "Nearly everyone who comes to pump out also buys gas," says Schmid. Schmid's pumpout station is free, but some marinas charge a small fee. Schmid believes that the pumpouts need to be easy to use and inexpensive in order to attract boaters. "There are two key components to making pumpouts work for water quality — education and more pumpout facilities," advises Schmid. "Every marina needs to have one that is convenient and cheap."

Boaters Clean Up (continued)

According to Ann Rodney of EPA's New England Division, "EPA does not actively solicit no-discharge applications. However, EPA's New England Division will assist any New England state that wishes to designate its water bodies a no-discharge area." EPA will assist RIDEM in installing more pumpout stations throughout Rhode Island and increasing education and outreach programs. With President Clinton's signing of the new Clean Vessel Act (part of the Transportation Equity Act for the 21st Century) on May 22, RIDEM will have more funds to do just that. Ten million dollars will be available annually from 1999 to 2003 to provide for more pumpout facilities, and another $5 million per year has been set aside for aquatic resources outreach and education.

The Opposition

Boat U.S., an association that represents boat owners, is concerned about the new designation. Since existing law already bans the discharge of untreated sewage from boats, Boat U.S. charges that the only real change is for those vessel owners who have already spent the extra money to install a treatment system that meets all EPA and Coast Guard standards. Such systems will now be illegal. Boat U.S. believes that there are not enough pumpout facilities for all the boaters in Rhode Island and that the state is spending limited resources to try to enforce new regulations when the existing laws are hard to enforce. However, in its Notice of Determination, EPA states that "adequate facilities for the safe and sanitary removal and treatment of sewage from all vessels are reasonably available for the area covered under this determination."

John Torgan of Save The Bay also disagrees with Boat U.S. "Boaters want clean water for boating, swimming, and fishing. During the summer season, sewage from boats creates significant water quality problems in some areas of the bay. This sewage poses serious health risks to swimmers, contributes to the closure of shellfish beds, and can make boating less appealing," says Torgan. "Designating the bay as a no-discharge area is a strong step toward eliminating this problem. By adhering to the no-discharge rules, boaters will be good neighbors — to each other, to swimmers, and to the environment." Save The Bay contends that similar designations on Block Island, the Great Lakes, and in other parts of the country have produced dramatic improvements in water quality in recent years.

Rhode Island already has regulations that call for spot inspections by harbormasters and other marine personnel in their service. The state has also entered into an agreement with the U.S. Coast Guard to share the responsibility for enforcing the law. In addition, any new marina construction or expansion requires the installation of a pumpout station at the cost of the builder.

Joe Migliore, an environmental scientist in the Division of Water Resources at RIDEM, admits that it will be difficult to measure water quality improvements gained as a direct result of the no-discharge designation. However, he stresses that "the new law will be very successful when improvements are measured cumulatively with other nonpoint source control programs already under way in the state."

The Bay Reaps the Benefits from Many Efforts

The increasing number of boaters using pumpout stations has already helped to improve water quality in the bay. Since the waters of Great Salt Pond (located on Block Island off the coast of Rhode Island) were designated a no-discharge area in 1993, shellfish beds that had been closed have been reopened. But smarter boaters aren't the only reason for such improvements in the bay. Rhode Islanders' tax dollars have added to the effort by helping to improve municipal sewer plants and reduce highway runoff. The Narragansett Bay Commission, created in 1980 by the Rhode Island General Assembly, has pledged $389 million to fix combined sewer overflows, which

Boating is Good Clean Fun

This year marks the first National Clean Boating Campaign, a nationwide environmental education effort to promote good stewardship of our water resources by boaters, marina operators, boat dealers, and manufacturers. The campaign is being led by a broad coalition of key boating groups, boating industry associations, businesses, environmental organizations, academia, and government agencies working together in a public-private partnership to protect inland and coastal waters. The campaign culminated this summer in the first National Clean Boating Week, held July 11-19 — the period of peak boat usage. It is organized by the Marine Environmental Education Foundation (MEEF) of Kingston, Rhode Island, which provides volunteer and partner organizations with a clean boating campaign planning kit. The kit includes a campaign poster, ads for newspapers, press releases, and a campaign action manual with instructions on planning for a successful clean boating event. MEEF hopes to engage more boaters, marine industries, and trade associations in the campaign. For more information, visit the National Clean Boating Campaign web site at www.cleanboating.org or e-mail goMEEF@aol.com.

Boaters Clean Up (continued)

dump raw sewage into the bay. The Commission provides wastewater collection and treatment services in the Narragansett Bay area.

Declaring the bay a no-discharge area is a critical step in making the bay clean and safe for Rhode Islanders and others who visit the area's 25 state parks, 160 marinas, and many beaches each year.

[For more information on EPA's role in the no-discharge designation, contact Ann Rodney, U.S. EPA New England Region, Water Quality Unit, JFK Federal Building, Boston, MA 02203. Phone: (617) 565-4885. For more information on RIDEM's role in the no-discharge designation, contact Joe Migliore, Division of Water Resources, RIDEM, 235 Promenade Street, Providence, RI 02908. Phone: (401) 222-4700, ext. 7258. For a list and map of pumpout stations in Rhode Island, visit www.state.ri.us/dem/pumpout/index.htm.]

EDITOR'S NOTE: Be sure to look for Issue #55 which will focus on additional coastal water resource protection stories.]

Study Says Long Island Sound Not So Sound

Some 20 million people live within 50 miles of Long Island Sound, and that number grows every year. The sound provides a multitude of jobs and recreation for its growing population, but what does it get in return? Not enough, according to a report released by the Natural Resources Defense Council, the Connecticut Fund for the Environment, and Save the Sound, all partners in the Long Island Sound Campaign.

In a report titled *Long Island Sound Municipal Report Cards: Environmental Assessments of 78 Communities*, the Long Island Sound Campaign found only 2 of the 78 municipalities surveyed to be doing a "very good" job of controlling pollution in the sound. Hoping to identify problem areas and to protect the sound for future generations, Long Island Sound Campaign organizers prepared the report to provide essential information to the municipalities and the public on what is being done to protect the sound's health.

What's Plaguing the Sound?

Since the passage of the Clean Water Act, water pollution control programs have greatly enhanced the quality of the sound's waters. However, the sound continues to be plagued by pollution. Sewage treatment plant discharges, untreated sewer overflows, contaminated runoff, and industrial waste are wreaking havoc on the sound's waters. Runoff from the 17,394-square mile watershed, much of which is covered by concrete and asphalt, picks up pollutants from five states and carries them to the sound. Beaches are often closed to swimmers, and shellfish beds are frequently closed to harvesters because of contamination. From 1986 to 1990, the Long Island Sound Study — conducted by EPA Region 10, the Connecticut Department of Environmental Protection, and the New York State Department of Environmental Conservation — found that 10 beach closures were due to pathogen contamination. And in New York, of the 66,000 acres of productive shellfish beds, 73 percent were either completely closed to shellfishing or subject to significant harvest limitations in 1990.

Report Targets Priority Problems

Campaign organizers sent each of the 78 municipalities bordering the sound a 25-page questionnaire in December 1996. Questions were asked on sewage collection and treatment systems, storm water management programs, the status of open space, wetlands protection and management programs, and beach monitoring and closings.

The report cards were designed to rate each pollution source that contributes to any of the six priority problems outlined in the 1994 Comprehensive Conservation and Management Plan (CCMP) for the sound — low dissolved oxygen, toxics, pathogens, floating garbage, habitat loss, and land use and development. (The CCMP was developed by states of Connecticut and New York, EPA Region 1 in the New England area, and EPA Region 2 in the New York area.)

Points were assigned in each of the five subject areas in approximate proportion to the importance of that issue for the sound as indicated by the CCMP. Within each subject area, points were assigned to different practices or factors based on generally accepted views of their contribution to pollution in the sound or effectiveness in protecting the sound. Each

Long Island Sound (continued)

municipality that implemented a certain practice or achieved a certain result received the assigned number of points. For example, sewage treatment plant personnel training programs, septic system inspection programs, and wetland restoration efforts are all practices that earned a local government more points.

The Results

Of the 78 municipalities, two rated as having outstanding programs in place that can be considered models for other local governments. Nineteen towns were considered to be doing a "good" job, 26 a "fair" job, and 8 "need special attention." According to the report, those municipalities needing special attention are experiencing substantial problems and could benefit from special efforts to turn their performance around. Twenty-three municipalities did not respond to the survey.

The study revealed that the vast majority of municipalities in both states lack requirements for septic tank maintenance and few have adequate septic inspection or maintenance programs. In addition, few municipalities have strong programs to address polluted runoff — one of the sound's largest sources of nutrients, heavy metals, and pesticides.

Laura Siegel, coordinator of the Long Island Sound Campaign and co-author of the report, is working closely with the municipalities to assist them with their implementation or improvement of pollution prevention practices. Siegel says that "most of the municipalities involved in the study have expressed appreciation for what the study was trying to accomplish." Siegel, along with staffers from Save the Sound and Connecticut Fund for the Environment, has been working "town by town" to gain more grassroots involvement in each community's efforts to help keep the sound clean. "We don't want the report to just sit on the shelf," says Siegel. "We want to keep things moving by acting as a liaison between citizens and municipal officials and help them get the resources they need to meet their goals."

Long Island Sound, deemed an "estuary of national importance" by EPA, is bordered by New York and Connecticut. Its watershed covers more than 16,000 square miles and is fed by four major rivers — the Connecticut, Housatonic, Quinnipac, and Thames. Its ecosystem contains nearly 2,500 species of plants and animals, contributing to the $5 billion each year generated from boating, fishing, swimming, and tourism.

Smithtown, New York Receives High Marks

Smithtown, New York was one of the two towns that received the highest rating (the other was Westport, located in Fairfield County, Connecticut). Smithtown, located in Suffolk County, covers 54 squares miles and has a population of 116,000. Some of the key factors that led to Smithtown's high rating include its strong storm water management program; its regulation of all underwater lands, including wetlands without regard to size; and, its biweekly testing of beach water that supplements county monitoring. In addition, Smithtown has limits on development in sensitive areas. If an area has been predetermined by the town planning department as an environmentally sensitive area, developers must go through an appeals process with the Town Board of Appeals before being allowed to develop there. Smithtown also places limits on the amount of impervious surfaces allowed in an area. Smithtown also recently began its first wetland restoration project on Harrison Pond. It is scheduled to be completed this year and will restore approximately 10 acres of wetlands. The town is also protecting its beaches through a Local Waterfront Revitalization Program, including biweekly water sampling, free pumpout stations for boat waste at municipal marinas, and pollution prevention literature that is distributed with boating permits.

Westbrook, Connecticut Has Long Way to Go

According to the study, Westbrook, Connecticut's pollution prevention program "needs special attention." Although Westbrook (located in Middlesex County) didn't score high, the survey provided an opportunity for the town to look at some of its problems and find ways to improve its pollution prevention programs.

The town rated low mainly because it is unsewered and served only by septic systems, which are inspected only in response to complaints. The report says the town has very few storm water prevention pollution practices and lacks an overall pollution prevention plan. Other areas where the report said Westbrook could improve are in limiting development in sensitive areas, restricting impervious surfaces, and by providing more pumpout stations.

According to Marilyn Ozols, chairperson of Westbrook Water Pollution Control Commission, the town's wetlands regulations and other zoning ordinances sufficiently limit development of

Long Island Sound (continued)

sensitive areas. She mentions that the town began three tidal wetland restoration projects last September. The town also recognizes that septic systems are a problem and is conducting a detailed evaluation plan with recommendations due next year.

Report Cards Opens Eyes

Despite the fact that the report cards received mixed reviews from the towns that were evaluated, everyone involved agrees that the assessments have opened the eyes of local government officials. Mark Tedesco of EPA's Long Island Sound Office comments that "the mere fact that the report cards were produced has increased environmental awareness in the area." Tedesco hopes that the increased awareness will foster greater watershed-based planning across municipal boundaries.

[For more information, contact Laura Siegel, Long Island Sound Campaign, NRDC, 40 West 20th Street, New York, NY 10011. Phone: (212) 727-4417; fax: (212) 727-1773. For printed copies of the report, please send $10.50 plus $3.50 shipping and handling to: NRDC Publications Department, 40 West 20th Street, New York, NY 10011. California residents must add 7.25 percent sales tax. Please make checks payable to NRDC.]

Urban Resources Partnership Links People, Government, and Natural Resources

"Hey! I think I've got one!"

Inner-city Chicago children can now experience the thrill of pulling a fish from Flatfoot Lake where, just a few years ago, vandals, litter, and invasive plants ruled. Near Denver, students at Oberon Middle School have created a legacy for future students in the form of an outdoor classroom.

These accomplishments are fruits of the Urban Resources Partnership (URP), which puts government resources into the service of community-led environmental projects. More than 1,000 projects in 13 cities include stabilizing streambanks, transforming blighted vacant lots into community gardens, developing a garden that teaches environmental stewardship and celebrates Aztec culture and history, and offering educational programs on prairie ecology, watersheds, and floodplain management. Residents, students, parents, teachers, TV and radio stations, businesses, state and local government, and seven federal agencies are among the many partners involved in this four-year-old program.

"It's a grand experiment," according to EPA's Rod Frederick, chairperson of the URP National Steering Committee. "It's a way the federal government can empower local folks to develop and implement resource conservation projects on their own. This program allows both older citizens and young people to become closely involved with conservation efforts that make a difference in their environment."

Equally important is the growing awareness and experience of the communities involved. By participating in URP projects, partners at all levels acquire the knowledge and skills they'll need to meet other environmental challenges — and perhaps to address other urban problems as well.

Vacant Lot Becomes an Outdoor Classroom in Denver

With the support of the Denver Urban Resources Partnership (DURP), the Arvada community transformed a weedy vacant lot and neighborhood eyesore into a restored ecosystem that is used as an outdoor classroom for 750 seventh and eighth graders. The constructed wetlands and pond treat runoff water from the grounds of the Oberon Middle School and its parking lot. Beautiful new landscaping, which features blue spruce trees donated by the students' parents, has turned the one-acre lot into a neighborhood centerpiece and source of pride. Says Gary Finstad of the NRCS Urban and Community Assistance Team, "The neighbors are pleased. They see an increase in wildlife, and they especially enjoy seeing the kids out doing something in the neighborhood."

Working with DURP, Arvada also developed a volunteer program for after-school community service, created interdisciplinary teaching materials, and conducted community outreach.

Urban Resources Partnership (continued)

The project was a real community effort. Middle school students remained after school to work on the project, and, on planting days, high school students joined them. Teachers supervised and developed curriculum. Parents pitched in when it was time to dig and plant trees.

The Colorado Water Conservation Board donated copies of *Water: Colorado's Precious Resource* to be used in the classroom for students and teachers to learn more about nonpoint source pollution. A local rental business donated necessary tools and equipment for the planting days. Arvada's TV Channel 8 used the project as part of a community-wide informational program to help inform the public about urban runoff. Local high school students conducted the video programming. Paul Schuster of the USGS is monitoring the water quality along with kids participating in the Rivers of Colorado Water Watch network.

Project leaders believe that the outdoor classroom would not have been completed within a single school year without the assistance of the DURP. "It has been gratifying to be able to work cooperatively with so many different entities and community resource people," they wrote in their progress report. "Most of all, our students are excited about being able to see their plans, dreams, and initiative come to a realization within the time frame of a school year. They were able to see this project through from the beginning to the end, while also leaving a legacy of 'I made a difference' for the students that will use and learn from the outdoor classroom in the future."

"Conservation Kids" Help Restore Chicago's Beaubien Woods and Flatfoot Lake

Another project in which the URP played an integral role was the renovation of Beaubien Woods and Flatfoot Lake on Chicago's far south side. Once considered nothing but a waste area, the site now offers neighborhood residents a respite from the urban landscape. City children participating in the Fishin' Buddies program can experience the joy of catching a fish, and lake visitors of all ages have come to appreciate and care for the natural environment.

Over the years, the 20-acre Beaubien Woods had become overgrown with thick, invasive vegetation, which often screened illegal activities. When a public survey revealed residents' concerns about the area's deteriorated condition, the Forest Preserve District, with assistance from the U.S. Fish and Wildlife Service, prepared an action plan for site improvements. Many agencies and organizations, including the Chicago Ornithological Society, Chicago State University, USDA Forest Service, Shedd Aquarium, The Nature Conservancy, Illinois Department of Natural Resources, and a youth organization called the Fishin' Buddies, joined to make the plan become reality.

The project began in 1994. Every summer since then, Fishin' Buddies has fielded a corps of five to 10 "conservation kids." With the assistance and guidance of Forest Preserve District staff, the kids have become stewards and advocates for the preserve. They clear undergrowth, allowing access to Flatfoot Lake and enhancing the condition of the many ecosystems surrounding the lake. They also serve as "creek clerks," assisting with fish stocking and keeping track of the lake's fish stock. At the end of each summer, the kids give written and oral reports, including exhibits, on their conservation effort.

Last year, the conservation kids accepted the challenge of a new project. They are now working on an interpretive trail, map, and inventory of the preserve's ecosystems.

One Good Thing Leads to Another

URP is an innovative partnership that has linked people, government, and natural resources to improve and sustain the quality of life in urban communities. For the outdoor classroom at Denver's Oberon site, benefits have been numerous. School administrators note that "Our students are given the credit for helping to resolve and carry out a difficult task while, at the same time, consulting with and learning from community resource

Location of Urban Resources Partnerships

Atlanta	Seattle
Denver	Philadelphia
Chicago	South Florida
East St. Louis	Las Vegas
New York	Buffalo
Los Angeles	San Francisco
Boston	

Federal Partners

U.S. Department of Agriculture - Cooperative Extension Service
U.S. Department of Agriculture - Forest Service
U.S. Department of Agriculture - Natural Resources Conservation Service
U.S. Department of Housing and Urban Development
U.S. Department of the Interior - Fish and Wildlife Service
U.S. Department of the Interior - National Park Service
U.S. Environmental Protection Agency

Urban Resources Partnership (continued)

people. Years from now, students will be back to see the Oberon site and be able to see the tree or bush they planted or the wetland they helped to design."

Teacher Chuck Clark, who works closely with Denver's Oberon project, sums it all up: "The most significant value is the connection that kids make with their natural environment."

Chicago's Beaubien Woods-Flatfoot Lake project has also resulted in many positive changes. Restoration of the lake area has enhanced numerous ecosystems. Recreational use of Beaubien Woods has risen significantly since the enhancements were completed, giving many people the opportunity to observe and learn about the flora and fauna native to their part of the planet. The conservation kids have gained new knowledge, skills, and abilities, and public school students will continue to learn about their watershed and natural science through environmental education classes held at the site.

According to Susan Mockenhaupt of the U.S. Forest Service, "The URP project has been designed with a five-year-startup phase with the expectation that the designated cities will then become self sustaining. The purpose of the startup phase is to build a local partnership between the federal, state, and local agencies; give the community groups experience applying for and managing federal grants; and, give the partnership experience working together to solve community environmental problems. The strength and flexibility of the partnership is derived from the wide range of technical and financial assistance the partnership can make available to improve the quality of life in the selected cities." The URP project will accept applications for four new cities in the spring of 1999.

Through education and active involvement, project participants build lasting ties to the natural environment, their communities, the government agencies that serve them, and each other. Oberon Middle School's comments about its model project could be applied to many URP projects: "It is a constant reminder of success. It may be that small success stories will move the community toward solving bigger problems."

[For more information on the national Urban Resources Partnership, contact Rod Frederick, Office of Water (4503F), U.S. EPA, 401 M Street, SW, Washington, DC 20460. E-mail: frederick.rod@epamail.epa.gov.

For more information about the Denver Urban Resources Partnership, contact DURP, 655 Parfet Street, Room E-300, Lakewood, CO 80215-5517. Phone: (303) 296-2903, ext. 262; web site: www.204.98.1.2/middle/oberon/outdoor_class.html.
For more information about the Chicago Urban Resources Partnership, contact Avery Patillo, URP, c/o U.S. Department of Housing and Urban Development, 77 West Jackson Boulevard, Chicago, IL 60604. Phone: (312) 353-2473; fax: (312) 353-0117; e-mail: avery.patillo@il.nrcs.usda.gov; web site: www.hud.gov/local/chi/chiurp.]

Where Does the Money Come From?

The Urban Resources Partnership and its projects are primarily funded through USDA grants. Additional funds and support from state and local agencies are used to match federal funds for projects and administration. Communities match federal, state, and local funding with labor, in-kind donations, and funding from local sources. Residents and local leaders identify the needs of their community and use the resources of government agencies to help meet them, ensuring that dollars and labor are used effectively.

Environmental Landscape Management Program Promotes Behavior Changes

Strategies to control nonpoint source pollution, like the beast itself, are very diverse. There are many angles and tactics that can — either directly or indirectly — reduce pollutant loads to waterways. Common to all approaches is that a change of behavior is usually required, either by individuals, industries, government, or other groups to bring about an improvement in environmental quality. Awareness and education are the first steps to making these changes.

The Environmental Landscape Management (ELM) program, developed in the late 1980s by the University of Florida Cooperative Extension Service, has taken the first steps and is now witnessing positive results. One component of the major statewide education program targets landscape professionals. The message is that attractive, healthy landscapes can be created by taking an ecosystem approach to landscape design and maintenance. Educational materials emphasize adopting proper cultural practices to reduce landscape problems and negative impacts on the environment.

In 1997, ELM program faculty in 23 counties made 26,305 personal contacts with landscape professionals, and reached an additional 24,184 professionals through newsletters. Seminars and training programs were conducted on a variety of topics. Questionnaires were used to evaluate the impact of the program on landscape management practices.

Program Promotes Behavior Changes (continued)

The 1997 activities included an Environmental Landscape Maintenance seminar attended by commercial landscapers, school and county grounds keepers, pest managers, and fertilizer dealers. A questionnaire given at the seminar was followed up six months later to compare any change in landscape practices. Sixty-five percent of the respondents used eight of the 19 recommended practices after the ELM training, compared to using only three before the training. Use of several ELM recommended practices (such as avoiding fertilization of established trees, irrigating according to season, and applying fertilizer at appropriate rates) increased by at least 15 percent after the training.

Other ELM seminars have focused on the use of integrated pest management (IPM). At one of these seminars, 96 percent of the participants surveyed said that they gained knowledge that would help them in using IPM in their jobs. Eighty-eight percent of the seminar attendees indicated that they would adopt environmentally-sound practices that they learned through the seminars.

An ELM-sponsored Garden Center seminar series attracted more than 491 employees of retail garden centers that hoped to portray a more environmentally friendly image. Attendance was motivated by the opportunity to earn continuing education credits for various programs and to learn practices that could increase retail sales. Practices that reduced pesticide and fertilizer inputs to the environment, such as targeting specific areas instead of blanket applications, were stressed. The focus of these seminars was on how these practices could bolster business. Potential reduced sales of pesticides and herbicides are offset by sales of fertilizers containing slow-release nitrogen (usually sold at a higher cost), soaps and oils in place of pesticides, mulches made from recycled wastes, and irrigation systems such as soaker hoses, drip systems, and timers. The retailers also hope that customer loyalty will increase by helping the customer do the "right" thing for the environment.

Although the common motivation for attendance at the landscape professional seminars was to learn about creating more beautiful landscapes while reducing costs, 75 percent of the post-training survey participants thought environmental considerations were important. Indeed, a few landscape maintenance companies are beginning to offer environmentally friendly methods as a selling point for customers who value protecting the environment.

ELM program managers realize that implementation of environmentally sound landscaping practices depends on well-educated landscape maintenance workers. To reach more of the audience, seminars in Orlando are offered in Spanish as well as in English, since many Orlando landscapers are Spanish-speaking.

Currently, program success is measured by how many contacts the ELM program is able to make through the seminars and other materials as well as by using the post-seminar surveys to evaluate behavior changes. ELM program managers agree that more specific data on cost effectiveness would be helpful to encourage even more landscape professionals to adopt practices that are good for the environment. Program managers also hope to secure resources to be able to monitor program success through actual environmental measurements, such as improvement in ambient water quality.

[For more information, contact Gary W. Knox, North Florida Research and Education Center, University of Florida, Route 4, Box 4092, Monticello, FL 32344-9302. Phone: (850) 342-0989; e-mail: gwk@gnv.ifas.ufl.edu.]

Notes on Stormwater Management

In Brownsville, Texas, Restored Resacas Elicit New Appreciation

The Lower Grande Valley landscape is threaded with resacas, ox-bow lakes that testify to the massive meandering of one of the country's longest rivers. According to the USGS's National Biological Service (NBS), resacas "may be the key to the high biodiversity" found in the region, providing habitat for such aquatic creatures as the Amazon molly and the Rio Grande siren. Resacas also provide critical habitat for two migratory flyways. In addition, the NBS suspects that the slender resacas, fringed with riparian vegetation, may be important corridors for rare feline species such as the ocelot and jaguarundi.

Brownsville Resacas Restored (continued)

But despite resacas' biological value, the city of Brownsville, Texas, with its 3,500 acres of resacas, has always seen them in a more utilitarian light. Resacas are an integral part of Brownsville's infrastructure and are used to transport and store the city's drinking and irrigation water. They also serve as storage reservoirs for use during drought conditions or when the Rio Grande's flow is low. Because the resacas include interconnecting culverts, weirs, and storm drain pipes, they function as the major avenue for stormwater runoff during times of heavy rains and occasional hurricanes.

Until recently, most Brownsville residents failed to notice the slow decline of Town Resaca and its sister systems, Resaca de la Guerra and Resaca del Rancho Viejo. Sediment-loaded runoff from the urbanized areas of the watershed is filling the lakes and clouding the water, with predictable impacts on the food chain. Where once the resacas abounded with diverse populations of native aquatic plants, fish, and waterfowl, they now support species that are more tolerant of urban pressures. In the last 10 to 15 years, sportfishing has declined noticeably.

In many areas, private landowners seeking a view of the resacas have stripped the vegetation from resaca banks and then bulkheaded the eroding shorelines. Resacas also suffer the impacts of illegal dumping and runoff contaminated with household chemicals, fertilizers, pesticides, automotive products, and litter.

Brownsville Cleans Up

With those losses, as well as the appearance of noxious plants and algae blooms, came the dawning realization that the resacas were not invulnerable. Suddenly aware of the waterbodies on which they depend, citizens of Brownsville enacted protective ordinances regulating bulkhead construction and littering and began an aggressive outreach and education program in 1995. As part of the outreach program, volunteers from the Brownsville Explorers and the South Texas Engineering, Math and Science Program (STEMS) helped city staff stencil more than 350 storm drains around the city. Spanish and English messages reminded citizens not to dump waste into storm drains. Local radio and TV stations ran public service announcements encouraging pollution prevention.

Perhaps one of the most successful aspects of the effort has been the installation of approximately 30 aerators in various resacas. Through the city of Brownsville, businesses took advantage of an opportunity to purchase the devices, which cost $6,000 apiece. The Brownsville Medical Center, Ebony Lakes Healthcare Center, Columbia Valley Regional Hospital, Roser and Associates, Rotary Club, and several local doctors purchased aerators.

Visible results were almost immediately apparent. Stagnant, turbid waters gave way to clearer, healthier waters, set off by sparkling fountains. Suddenly the resacas, especially Town Resaca located in the heart of Brownsville, have became treasured centerpieces, well worth preserving.

In tandem with these measures, the city is conducting a project in the 3,500-acre watershed of Town Resaca. The goal is to reduce the amount of nonpoint source pollutants, such as sediments, pesticides, and heavy metals, entering the resaca by 40 percent over a four-year period. More than 30,000 people live in the city of Brownsville. The city has used water quality data collected by both professional monitors and volunteers to gauge the amount of pollutants entering the Town Resaca system. Once the severity of the pollutants was identified, the city designed and is now implementing structural BMPs such as vegetative filters, detention basins, and stormwater treatment systems in an effort to reduce the pollutant load entering Town Resaca.

One portion of the project involved habitat restoration and bank stabilization along a 600-foot stretch of Town Resaca's shoreline. The demonstration area showing how aquatic plants can be reestablished is a multi-agency and community partnership project involving the city of Brownsville, Texas Natural Resource Conservation Commission (TNRCC), U.S. EPA, Texas Parks and Wildlife Department, and U.S. Army Corps of Engineers. Volunteers from the STEMS program assisted in planting nine species of native aquatic plants — umbrella grass, flatstem spikerush, squarestem spikerush, bulltongue, pickerel plant, tall burhead, creeping burhead, hudson sagittaria, and wild celery. Once established, the plant community is expected to improve water quality and clarity, stabilize eroding shorelines, provide desirable fish and waterfowl habitat, and improve the aesthetic appeal of the resaca.

Brownsville Resacas Restored (continued)

Joe Hinojosa of the Brownsville Department of Public Works led the project. "This bank and aquatic habitat restoration project is the first of its kind to be undertaken in an urban setting in Texas," he says. "The hope is that what is learned from the project can be applied to other resaca sections in the city as well as other urban waters in Texas. Better habitat for fish and wildlife, clearer, cleaner waters, and increased beauty for our resacas are benefits all Brownsville's residents can appreciate."

The effects so struck some Brownsville landowners that municipal offices have received calls from several private landowners asking to be included in the restoration activities. In response to the calls, the city plans to join TNRCC and the Army Corps of Engineers to conduct a follow-up informational workshop and recruiting exercise to enlist help from the private sector in the revegetation/bank restoration project. Upcoming events also include a cooperative effort with the U.S. Fish and Wildlife Service to introduce black-bellied wood duck houses on private lands next to resacas in an effort to increase the bird's habitat.

[For more information, contact Chris Loft, Texas Watch, TNRCC, PO Box 13087, Austin, TX 78711-3087. Phone: (512) 239-4715; fax: (512) 239-4760. Or contact Joe Hinojosa, Department of Public Works, City of Brownsville, (956) 542-7511.]

Targets of Opportunity: An Urban Retrofit Program

Visitors to Old Town Alexandria may find themselves harking back to the 1700s, the days when George Washington lived there. But a good look at the city's stormwater management program snaps the future into clear focus. This Virginia city's urban stormwater BMP retrofit program is anything but old-fashioned.

Because of its close proximity to the Chesapeake Bay, the city must comply with Virginia's Chesapeake Bay Preservation Act of 1988 (CBPA). Under the act, the entire city was designated as a Chesapeake Bay Preservation Area, requiring that all development and redevelopment of land in the city meet specified stormwater management criteria. The criteria includes incorporation of BMPs, compliance with locally adopted regional stormwater management programs and stormwater discharge permits, at least a 10 percent reduction of NPS pollution on redevelopment sites not currently served by BMPs, and restoration of at least 20 percent of a redevelopment site that is completely impervious as currently developed to vegetated open space.

In 1992, the city of Alexandria enacted the Chesapeake Bay Preservation Ordinance which contains provisions from both the CBPA and the Stormwater Management Act. Under the new ordinance, city staff identified several sites where urban retrofits appeared possible — laying the groundwork for the Targets of Opportunity Program. The objective of this aggressive urban stormwater BMP retrofit program is to enhance the requirements of the CBPA with additional treatment of stormwater runoff from built-up areas not directly addressed by the act.

In December 1996, the Shenandoah and Potomac River Basins Tributary Nutrient Reduction Strategy, called for by the Commonwealth of Virginia, set an additional goal of 4,356 acres of urban retrofit within the entire basin. While comprising only 3.3 percent of the total urbanized area within the Potomac and Shenandoah basins, Alexandria had already contributed almost 23 percent of the total urban retrofit target through its up-and-running Targets of Opportunity Program.

Bursting at the Seams and Streams

The city of Alexandria, covering nearly 16 square miles, lies on the west bank of the Potomac River, six miles south of Washington, DC. With a 1990 population density of 7,281 people per square mile, Alexandria is the most densely developed city in Virginia and the eleventh most densely populated in the U.S. Since 1988, the city has experienced unprecedented commercial development. More than two million square feet of new office complexes have been constructed. Forty-one percent of the total city area is covered with impervious surfaces.

Such a high percentage of impervious surface is bad news for urban streams. Alexandria is a city interwoven with more than 17 miles of streams and rivers, including the Potomac River, Four Mile Run, Cameron Run, Strawberry Run, and other smaller tributaries. Almost all are

classified as "severely degraded urban streams." Protection and restoration of these streams and ultimately the Chesapeake Bay is the focus of the Targets of Opportunity Program.

Hitting the Target

Seven urban stormwater BMP retrofit projects have been designed under the Targets of Opportunity Program — five regional retention basins (wet ponds) and two extended detention basins (dry ponds). Warren Bell, city engineer and Targets of Opportunity Program coordinator, believes that properly designed wet ponds are the best stormwater BMPs on the market. Bell credits wet ponds as being "low-maintenance, requiring no human intervention, and achieving extremely high pollutant removal rates."

"In Alexandria, wet ponds can be very expensive because they take up large tracts of land," says Bell. "The cost of purchasing the land for a wet pond can climb to $60,000 just to treat one acre of impervious surface." Most of the projects were voluntarily designed, constructed, and paid for by the property's developers — stakeholders with vested interests in improving the property and saving money in the long run.

The Targets of Opportunity Program's success revolves around the following four elements:

- *Knowledge of the watersheds within the jurisdiction.* Aerial photographs and topographic maps were very useful, but discussion with storm and sanitary sewer maintenance personnel proved to be invaluable. Working with stormwater maintenance personnel helped the city decide which areas would benefit the most from a retrofit.
- *Identification of potential opportunities for urban retrofits.* To be cost-effective, Alexandria focused on areas with existing ponds and detention basins which could be adapted as wet ponds or dry ponds.
- *Early exploration of urban retrofit options with owners and developers.* Alexandria's zoning ordinance requires a pre-submission conference between the city and the developer for all significant construction projects.
- *Creating "win-win situations" for both the developers and the public.* Fostering a spirit of cooperation between the parties rather than developing a regulator-regulated relationship was crucial for program success.

Case Study: Cameron Lake Regional Retention Facility

Upon closure of Cameron Station Army Base, a 164.5-acre installation in Alexandria, the Army sold the property for private development. Before the property transfer was complete, the land had to be zoned. While doing so, city engineers noted that two connected lakes on the installation could be used as stormwater retention ponds.

As a condition of the sale, the new owners were required to drain all future development on the site through the lakes. City storm sewers crossing the base also had to be rerouted through the lakes. Realizing how much money would be saved compared to the cost of installing sand filters to treat runoff from the site, Greenvest L.C. (the developer who purchased the land) decided to retrofit the lakes. Sand filters would have been required if the developer had wanted to hold the development density at the same level. The retrofitted retention ponds allow for a greater density of development, which more than compensated for the cost of retrofitting the lake.

Constructed during the summer of 1997, the facility now treats runoff from nearly 250 acres, of which 187 acres did not previously drain through the lakes. When full buildout is complete, the lakes will remove more than 700 pounds of phosphorous and 3,200 pounds of nitrogen each year from runoff coming from the urban retrofit area of the watershed entering Backlick Run, a tributary of the Potomac River.

Case Study: Potomac Retail Center Urban Retrofit

Another Alexandria developer began to design a 60-acre shopping center in an area that was part of a former rail yard in the northern portion of the city. The project required treating runoff from U.S. Route 1 and adjacent properties (9.9 acres) formerly draining through ditches in the rail yard. Instead of constructing a costly separate treatment system for off-site runoff, the developer decided to route it through a large retention pond being built to treat the runoff

Urban Retrofit Program (continued)

from the shopping center. Alexandria city engineers estimate that the retention pond is removing 31.8 pounds of phosphorous and 188.7 pounds of nitrogen each year from off-site water.

The Big Picture

The seven retrofit projects have provided a total of 996.8 acres of urban retrofits since 1992, and that number will continue to climb as full buildout of all the projects is realized. So far, city engineers estimate that the ponds have removed more than 2,500 pounds per year of phosphorus and more than 10,000 pounds of nitrogen — far exceeding the total basin target for phosphorus removal and making up 97 percent of the total basin target for nitrogen.

In December of 1997, the city was awarded a Community Innovation Award by the Chesapeake Bay Local Government Advisory Committee for its contribution and commitment to the protection and restoration of Chesapeake Bay Watershed through its Targets of Opportunity Program.

Bell is now looking into using the regional stormwater facilities in a permit system through which developers would be able to purchase phosphorus or nitrogen reduction credits from the facility in lieu of constructing stormwater BMPs on their property. Currently, new development in Alexandria requires the construction of approved stormwater BMPs to alleviate stormwater pollution. Bell expects to receive approval for the system within the next two years.

Most visitors, gazing out over the Potomac River or retracing the steps of George Washington along Old Town Alexandria's historic waterfront, will never be aware of it, but the beauty and health of that river owes much to Alexandria's city engineers.

[For more information, contact Warren Bell, Deputy Director for Engineering, City of Alexandria, P.O. Box 178, City Hall, Alexandria, VA 22313. Phone: (703) 838-4327; fax: (703) 838-6438.]

Notes on Urban Watershed Planning and Management

Urban Forests Decline; Runoff Increases in Puget Sound Area

A new study by the national conservation group American Forests documents a dramatic loss of tree cover in the 3.9-million-acre Puget Sound urban corridor from Olympia to Tacoma to Seattle to Everett. The analysis calculates previously unreported costs and benefits of tree cover as it relates to stormwater management and air quality in this increasingly urbanized region.

The analysis of three satellite images from 1972, 1986, and 1996 found that areas with high vegetation and tree canopy coverage declined by 37 percent, from 1.64 million acres to 1.04 million acres. During the same 24-year period, areas with low tree cover more than doubled from 25 to 57 percent of the total study area. High canopy coverage was defined as 50 percent tree cover or more. Very low canopy coverage was defined as less than 20 percent tree cover.

"While much attention has been focused on the rural forests in the Pacific Northwest, our study underscores the importance of also understanding what's happening in the region's growing urban areas," says Gary Moll, study author and vice president of American Forests' Urban Forest Center. "Urban forests offer substantial dollar benefits that are not replaced easily by costly, manmade alternatives. This presents an opportunity to use trees in designing more cost-effective city infrastructures."

The loss in tree cover and increase in impervious surfaces, such as roads and buildings, increased the costs of stormwater management. The study found that stormwater flow during a peak storm event increased by an estimated 1.2 billion cubic feet or 29 percent. Replacing this lost stormwater retention capacity with reservoirs and other structural systems would cost $2.4 billion ($2 per cubic foot). This service was provided previously by trees, vegetation, and natural soils, which slow stormwater movement, lower total runoff volume, and reduce costly flooding, according to the American Forests report.

Urban Forests Decline (continued)

Air quality control costs also grew. The lost tree canopy would have removed about 35 million pounds of pollutants from the atmosphere annually at a value of approximately $95 million. Puget Sound's urban forest improves air quality by removing nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and particulate matter 10 microns (PM10) or less. Atmospheric nitrogen deposition has been found to be a significant source of pollution in some coastal areas, notably the Chesapeake Bay.

"One consequence of this loss of tree cover and increase in stormwater runoff is the degradation of streams that are so important for healthy salmon populations," says Moll. "By halting this decline and strategically planting trees — millions of them — stream restoration can be accelerated, improving salmon habitat and providing many other benefits."

The Puget Sound region is not the only area to show the impacts of tree loss. Last year, American Forests released a study showing that between 1986 and 1993, development displaced trees in Atlanta, Georgia, increasing stormwater runoff on a net total of approximately 500,000 acres. It estimates that the city would have to spend at least $2 billion to replace the urban forests' stormwater retention function.

"We found that removing natural vegetation and replacing it with manmade structures has a high cost. That makes a strong argument for incorporating natural systems into the decision-making process and finding new ways to build cities," says Moll.

In both Atlanta and the Puget Sound area, American Forests used Geographic Information Systems (GIS) technology and its CITYgreen software to measure urban forest health and values. The next step is to conduct more detailed, neighborhood-level analyses. American Forests is now looking for additional community partners to join in the Puget Sound effort. The regional and neighborhood analyses will assist decision makers in developing information and tools to measure urban ecological values and to better incorporate environmental systems into their planning processes.

"The Puget Sound's rapid urban growth is the single largest factor affecting its ecosystem," says Deborah Gangloff, American Forests executive director. "By understanding the value and importance of trees and forests, municipal officials and planners have a great opportunity to use this natural capital to the greatest possible benefit."

The study underpins a major cooperative tree-planting campaign being developed by American Forests and sponsored by specialty retailer Eddie Bauer. Global ReLeaf for the Puget Sound, part of American Forests' Global ReLeaf 2000 campaign to plant 20 million trees for the new millennium, will be launched in October.

The Puget Sound Regional Ecosystem Analysis was funded in part by the U.S. Forest Service. The data is available free to city and county governments.

[For a copy of the report ($12, complete with color canopy maps) or information about CITYgreen software, contact American Forests, P.O. Box 2000, Washington, DC 20013. Phone: (202) 955-4500. Or visit American Forests' web site, www.amfor.org, which includes an on-line demonstration of CITYgreen.]

Buried Urban Streams See the Light

by Richard Pinkham, Rocky Mountain Institute

EDITOR'S NOTE: This article was taken from a draft report in progress for U.S. EPA Region 1 on nationwide daylighting projects.

The modern era has not been kind to streams. As humankind has clustered into cities large and small, we have polluted, diverted, straightened, channelized, piped, filled, and otherwise used and abused streams, often beyond recognition.

These habits are beginning to change. Policymakers, engineers, and builders increasingly recognize the value of maintaining natural drainage patterns and stream channels in new development. And, in some places, people are regrading and revegetating mangled stream channels to restore their functions and beauty.

Buried Urban Streams (continued)

"Daylighting" is perhaps the most radical development in stream restoration. Daylighting projects bring previously culverted or piped streams, creeks, or stormwater drains to the surface. Daylighting projects reestablish a stream in its old channel where feasible, or create a new channel if necessary. Some daylighting projects recreate wetlands and ponds as well.

The daylighting phenomenon is relatively new, beginning in the mid-1980s in North America. Restorers at Strawberry Creek in Berkeley, California, transformed four acres of abandoned rail yard into playing courts, rolling hills, grassy meadows, native trees, and a babbling brook in 1983-84 at a cost of $650,000 (including $65,000 for creek restoration). Many consider it a model daylighting project. Daylighting is also practiced in Europe and Canada.

Restoration of existing surface channels is becoming common, and daylighting is a subset of urban stream restoration. However, some important issues give daylighting projects additional complexity:

- Pulling up a culvert and creating a new channel where none exists usually involves a significant amount of earthmoving, adding expense.
- Finding the old channel, which is usually the best place to recreate the stream, can be difficult. Rediscovering a channel often involves conducting historical research, examining soils, and looking at the channel characteristics upstream and downstream.
- Daylighting projects are more likely to be squeezed for space. The less space, the less chance of creating a natural channel geometry and properly vegetated riparian corridor.
- Additional hydraulic issues might be involved. For instance, it may be necessary to build up hydraulic head to put a daylighted section of stream back into a pipe at its downstream end.
- The problems afflicting a buried stream or culvert are hidden and difficult to point out. Since there's "nothing" there now, a daylighting project can require extra community education and outreach to allay fears and help people visualize the project's potential.

In spite of these obstacles, interest in daylighting is increasing because people are recognizing the functional values of healthy streams. They see a need for new urban greenways and parks and often have a deep desire to "set right" harm done to the environment years ago. The Jolly Giant Creek daylighting project exemplifies all three.

Jolly Giant Creek Highlights Daylighting

The daylighting of Arcata, California's Jolly Giant Creek began in 1991 as an environmental education project at the adjacent high school. The project was taken up by a regional development and advocacy agency and eventually funded by the state. The stream corridor is now a major pedestrian thoroughfare and passive recreation area.

Jolly Giant Creek arises in Arcata's community forest (logged sustainably for city revenue) and flows six miles to the Pacific, passing through a university campus and downtown Arcata on its way. Much of the creek from the campus to downtown was culverted and channelized as development took place. Between these two current centers of activity, the land was neglected over recent decades after local lumber mills shut down.

In 1990, high school biology teacher Lewis Armin-Hoiland proposed daylighting a section of the creek that crossed beneath a corner of the school district property, an abandoned dump that lay in a tangle of briars and berry vines. Armin-Hoiland's objective was to create an outdoor ecology laboratory for the high school. Lacking the information needed to obtain permits from the U.S. Army Corps of Engineers and the California Department of Fish and Game, he approached Humboldt State University for help. An aquatic ecosystems restoration class in the fisheries department responded to the call. Multiple teams examined the creek's ecology, hydrology, and use, and designed concepts for daylighting and restoring the high school reach.

Two Humboldt State University students, master's candidate Melissa Bukosky and undergraduate Tom Hagberg, became so involved that they continued to work on the project after the class ended. They gathered more hydrologic data, developed flood frequency tables, engineered a channel design, researched revegetation options, wrote a project plan, and assisted in securing the necessary permits.

Buried Urban Streams (continued)

The Redwood Community Action Agency (RCAA), a private nonprofit regional development organization obtained a $25,000 grant from the California Department of Water Resources Urban Streams Restoration Program. They hired Bukosky to act as a liaison with the construction team.

In the initial Jolly Giant project, construction crews removed about 100 feet of culvert and installed a sedimentation basin where the creek emerges onto the high school property from a culvert through university land. Next comes a one-third-acre pond, which slopes gradually at the edge to provide shallows for emergent aquatic vegetation, and then more steeply toward a deeper center that provides fish habitat.

Downstream from the pond runs 75 feet of new stream channel with woody structures to create fish habitat and control flow. Willow plantings stabilize the banks. The new channel finally gives way to a recovering natural stream channel — not the channel the culvert previously dumped into, but an older channel found during site analysis to be largely dewatered while still maintaining some riparian vegetation. The entire site covers about six acres.

Downstream of the high school, two abandoned lumber mills had been purchased by the city and slated for development into a park that was not, according to Bukosky, "creek friendly." The local neighborhood rebelled and formed the Friends of Jolly Giant. Their campaign of presentations, input at city meetings, letter writing, and other activities convinced the city to let the neighborhood plan its park as a natural landscape with passive recreational opportunities.

Restoration began on the mill sites in 1995. Jolly Giant Creek ran on the surface through much of this reach, but it had been channelized, culverted in places, diverted into log ponds, and otherwise manipulated long ago. Concrete slabs covered much of both sites. With state funding, RCAA and the city removed the slabs, wood waste, and other debris, recontoured a floodplain, and established a new channel geometry.

At one downstream mill site, the old channel was left in place for high water overflow and a new normal flow channel was created. Some of the fill excavated from both sites was used to create a berm needed around part of the property. A small culvert under an adjacent railroad track now regulates storm flows, creating a seasonal wetland and wet weather detention pond that holds up to 2.5 acre-feet. Overall, the project daylighted 160 feet of the creek and restored more than 400 additional feet of Jolly Giant Creek.

Funding totaling $120,000 (including a U.S. Fish and Wildlife Service Challenge Cost-Share) came primarily from the California Department of Water Resources Urban Stream Restoration Program. Available funds were highly leveraged by the donation of time and materials. The city itself contributed $35,000-40,000 in in-kind services. Jay Franke, a heavy equipment contractor who does restoration work in Redwood National Park and whose family owned the mill sites, donated substantial labor, material, and equipment. The National Tree Trust provided many trees. Students and RCAA staff did much of the planning and design work. Thousands of hours of volunteer labor went into revegetation efforts, and students conducted assessment and monitoring.

Daylighting Provides Giant Values for Arcata

The return on the investment has been great. The Jolly Giant daylighting project and the associated downstream restoration work have created a valuable new public space in the city of Arcata. The park is an attraction for the neighborhood, and the handicapped-accessible trails provide access for all. Previous footpaths have been transformed into bona fide trails, and new bridges have increased safety for pedestrians.

The project also provides the outdoor classroom envisioned by Armin-Hoiland. Many students have been involved in restoration and monitoring throughout their high school years, and some have gone on to college studies in biology and other sciences. Besides specific curricular benefits, Bukosky believes that the value of reconnecting people to nature and promoting stewardship should not be underestimated.

Environmentally, the project has been very successful. Successional dynamics in the revegetation effort are well established. Monitoring has shown improvements in water quality and aquatic biodiversity. Resident cutthroat trout are thriving in the restored reaches. Settling of sediments (the sedimentation basin has been dredged several times since its creation);

radically improved channel and floodplain geometries; installation of habitat-creating structure; and, establishment of riparian and wetland vegetation to provide shade, nutrient and pollutant uptake, and erosion control have all contributed to the improved physical and biological performance.

The efforts have even helped shape city policy. The city is now actively pursuing acquisitions and easements along local streams and is initiating other projects to restore the hydrologic and ecological functions of its riparian corridors. Arcata is also preparing a new drainage master plan. In 1996, Arcata hosted a western regional urban stream restoration conference attended by 300 people.

Bukosky reports that the biggest challenge was establishing the channel geometry. Although annual average flow is 5 cubic feet per second (cfs), annual average peak flow is 128 cfs and the 100-year event is 250 cfs. Because of urban land uses upstream, Jolly Giant Creek comes up quickly with each rainstorm. In addition to establishing the bankfull and low-flow channel geometries, the designers established a floodplain where none had existed before. Bukosky points out that projects like this in fact involve three significant restorations — channel, floodplain, and vegetation.

Daylighting Lessons Learned

Asked for advice for others contemplating daylighting projects, Melissa Bukosky offers these suggestions:

- Do a thorough historical analysis of the site. What's underneath will affect the cost of everything from the excavation effort to the fertilization requirements. Revegetation on the highly disturbed soils of the lumber mill sites required lots of fertilizer, water, mulch, and tender loving care.
- Have funding secured before proceeding too far. Daylighting projects are expensive.
- Plan the logistics of project construction carefully, especially if the seasonal window for earthmoving and planting is narrow, as it is on the rain-soaked northern California coast.
- Use contractors who understand restoration well. Engineers who haven't done this sort of work might not fully appreciate the complex hydrologic, biological, or aesthetic issues. Earthmoving contractors must be clear about the objectives. Often the more people involved, the better. It takes many types of expertise to pull off projects.
- Find a qualified generalist to pull it all together — someone who has broad enough training or experience to understand the approaches, language, and data of all the various experts participating in the project, and who has the requisite intuition to envision the desired outcome and steer the project toward it.
- Work hard to develop a constituency for the project. Fostering supportive neighbors and users pays off politically and economically, in the form of volunteer labor.

Motivations and Objectives

Why go to the trouble and expense of challenging city officials, researching old creek beds, moving many tons of materials, and untangling red tape? The benefits are many and are often interrelated.

The functional values of opened waterways are important benefits. Riparian vegetation can improve water quality by taking up organic and inorganic pollutants. The California Urban Creek Council's Carol Schemmerling says that this is a frequent objective of Bay area daylighting projects, in part to improve bay shore estuary marshes, which should be dedicated nursery habitat rather than de facto treatment zones. Open waterways can also slow and infiltrate runoff, to the advantage of downstream residents, or speed its passage in comparison to culverts that might have choked flows, flooding upstream areas. Daylighting is also a way to remove water from combined sewer systems (as in the Seattle's proposed Ravenna Creek project and Portland, Oregon's proposed Tanner Creek project), and to free up wastewater system capacity (as in an extensive daylighting program in Zürich, Switzerland).

Creating habitat is another motivation for daylighting projects. Projects in the state of Washington included restoration of salmon passage and habitat as primary objectives. Other projects have noted creation of wildlife corridors in the urban landscape as a goal.

The educational value of bringing aquatic and riparian ecosystems closer to students, whether at the grade school or university level, is an important related benefit.

New recreational and leisure opportunities can be key benefits. These can range from a challenging new water hazard on a private golf course to places for city kids to splash. At the local level, a creek can be a very valuable attraction, even a focal point, in a public park. At a regional level, restored creeks can define a network of urban greenways and paths as in Vancouver, British Columbia's recent and planned projects.

Reconnecting people to nature is a frequent theme of daylighting proponents. In Vancouver, planner Alan Duncan says surveys show people are interested in daylighting and creek restoration because they see restoring salmon as an important regional goal. They want to take

Buried Urban Streams (continued)

their kids to streams right in the city to see salmon spawning. Being able to do this, they feel, is part of living in and being connected to the Pacific Coast rainforest ecosystem.

Whatever the motivations may be, across the United States and in Canada and Europe, daylighting is being contemplated as a viable option for urban communities as many more buried streams wait to see the light.

[For more information and for updates on the report's availability, contact Richard Pinkham, Senior Research Associate, Rocky Mountain Institute, 1739 Snowmass Creek Rd., Snowmass, CO 81654. Phone: (970) 927-3807; e-mail: rpinkham@rmi.org.]

Smaller Lots, Happier Residents? New-Age Subdivisions Preserve Natural Areas

As today's cities expand, new residential subdivisions seem to be springing up everywhere. More subdivisions means more homes and more streets, which means less wooded areas and open fields, right? Not necessarily. More and more towns are turning to open space zoning — regulations that require the grouping of new homes on half or less than half of a development parcel so that the rest can be preserved as unbuilt open space.

Conventional zoning separates different land uses like shopping centers and residential areas, but it does little to protect open space. Many towns protect sensitive areas such as wetlands, floodplains, streambanks, and steep slopes, but most overlook other natural lands like woodlands, wildlife corridors, wildflower meadows, or farmland — areas that could be used to filter stormwater runoff.

Instead of putting homes on one-acre lots in a one-acre zoning district, open space zoning or "cluster" zoning groups the same number of homes or more on much smaller lots and sets aside the remaining land as open space. The open land can be used for a park or can become part of a greater open space network of stream corridors, trail systems, wetlands, or other natural areas. In most cases, the open land can be maintained through a homeowners' association.

Water quality professionals everywhere know that wooded areas and streamside buffer zones help keep water bodies clean, while impervious surfaces like roads and parking lots have the opposite effect, channelling pollution-filled runoff directly to streams and rivers. Open space zoning can help alleviate some of the runoff problems associated with increased development by decreasing the percentage of impervious surface area in a community. With fewer roads, sidewalks, and driveways, runoff can filter through the natural areas and enter local streams much cleaner.

Cluster zoning provides many other advantages, including the following:

- A reduction in the cost of building roads, water and sewer lines, and other infrastructure — a savings that is transferred to home buyers
- Lower property taxes as a result of the city's not having to purchase open space
- The conservation of natural resources such as wetlands, riverfront, fields, and pastures, improving water quality and wildlife habitat
- The preservation of the rural nature of a community, resulting in a higher quality of life

Property owners are able to maximize the return on their land through increased property values. Lots that are adjacent to open space sell faster than lots that are surrounded by more of the same. In Bucks County, Pennsylvania, 137 acres of permanently preserved fields and 76 acres of protected woodlands have helped to make one 418-acre subdivision the fastest selling development in its price range in the county. In Bethel Township in southern Delaware County, Pennsylvania, preservation of local woodlands has also increased. There, prospective buyers touring the model homes receive a brochure describing the hiking/walking trails located in the woodland. Homes that abut the densely wooded open space sell at a premium because they give the homeowner the feel and privacy of a large lot. In addition, the developer's creative use of low-lying woods as a temporary stormwater detention area help avoid a more traditional approach in which many trees within the preserved natural area would have been removed to make way for a conventionally engineered basin.

Case Study: Open Space Plans Help Protect Buzzards Bay

The population in the Buzzards Bay watershed, which spans nearly 750 square miles in Massachusetts, increased nearly 50 percent between 1950 and 1986 and is still growing at a high rate. This population growth underlies a large increase in residential development. Pollution associated with the sprawl has led to alarming increases in pollution in the bay, particularly nutrients and pathogens.

In December 1994, the Buzzards Bay Project, part of EPA's National Estuary Program, was awarded funding to initiate a technical assistance program to help municipalities in the watershed develop comprehensive open space plans to slow the sprawl. Plans have been completed and approved by the Buzzards Bay Project for all but one municipality in the watershed. (The plan for the town of Westport will be submitted in the next few months.) The preservation of open space was just one of the many recommendations spelled out in the bay's Comprehensive Conservation and Management Plan.

The plans vary from town to town and include innovations, such as requiring larger lot sizes to reduce the number of houses in an area, cluster development options, and the purchase of sensitive land by the town. Under its open space plan, the town of Mattapoisett is working to develop a zoning ordinance that would require new subdivisions to base lot size calculations on upland area, i.e., for each one-acre lot allowed in a wet area, there must be a one-acre match in an upland area.

Buzzards Bay Project Director Joe Costa believes that such plans are just one of many avenues that can be taken to protect water bodies from nonpoint source pollution. The open space plans developed for the Buzzards Bay municipalities "will help prevent further degradation of the bay and work toward long-term protection of water quality in the watershed," says Costa.

Case Study: Open Space Zoning Keeps Upper Frederick Rural

Upper Frederick, Pennsylvania, located in Montgomery County, embodies the perfect small town setting. County planners are working hard to keep it that way. In 1990, the Montgomery County Planning Commission (MCPC) developed the Land Preservation District as a model zoning ordinance that could be tailored for and adopted by each of the county's 62 municipalities. The model ordinance requires 75 percent of each newly developed area to be preserved as open space. The ordinance ensures that each new home either backs up to or fronts public open space.

The Upper Frederick Township Board of Supervisors, wanting to preserve Upper Frederick's rural character, adopted the 75 percent open space zoning ordinance in 1991. Several towns bordering Upper Frederick have already experienced a marked increase in residential and small business development over the last 15 years. The Board of Supervisors hopes to continue to preserve the township's open space as farmland owned by local residents.

New Zoning Requires Careful Planning

Questions still remain as to how open space should be used for each community. Should it be kept natural or used for recreation? What uses are suitable for community residents and the municipality overall? What uses can the land support? Should a meadow be preserved or allowed to grow up into a woodland? If farming is to continue in the open space, as in Upper Frederick, what mitigation measures are needed for water quality and quality of life? Should meadows be planted rather than manicured lawns? A landscape management plan identifying how open space will be used and managed to meet community goals can answer these questions.

[For more information on MCPC's ordinances, contact Brian O'Leary, Montgomery County Courthouse, Planning Commission, P.O. Box 311, Norristown, PA 19404-0311. Phone: (610) 278-3728.]

Backyard Conservation — It'll Grow On You

To many farmers, protecting soil and water resources is old hat, but, to their nonfarming neighbors, it may be a novel concept. With their new Backyard Conservation campaign, the Natural Resources Conservation Service (NRCS), National Association of Conservation

Backyard Conservation (continued)

Districts (NACD), and Wildlife Habitat Council (WHC) hope to teach city dwellers to use some of the same resource protection practices that farmers have been using for more than 60 years.

The Backyard Conservation campaign was formally launched on Earth Day and is planned as a two- to three-year campaign. It features 10 conservation practices that have been scaled down for homeowners to use in their yards — backyard ponds, backyard wetlands, composting, mulching, nutrient management, pest management, terracing, tree planting, water conservation, and wildlife habitats. The practices can be implemented almost anywhere: on several acres in a rural neighborhood, in an average-sized suburban yard, or on a tiny plot in the city. They are easy to use and maintain, and most are inexpensive. The projects can be completed by individuals or families, and many can be adapted to community gardens, schools, and other public places.

The Backyard Conservation campaign will educate urban residents about conservation practices in an effort to strengthen the link between the agricultural and nonagricultural communities. Through 10 conservation tip sheets, the campaign gives homeowners an opportunity to do something that can contribute to environmental health and good land stewardship while beautifying their yards at the same time. With more than 92 million acres of U.S. land developed and much of it owned by individuals or families, the more urban and suburban residents taking part in resource conservation alongside their agricultural counterparts, the better.

Build A Backyard Wetland or Create Organic Mulch

Many of us have vegetable or flower gardens in our backyard, but what about a mini wetland or an organic mulch pile? Probably not. Backyard wetlands help prevent pollution of neighboring creeks and may prevent flooding. A wetlands tip sheet provides details on the functions and values of wetlands and how a backyard wetland can improve runoff. The sheet lists the steps involved in constructing the wetlands and establishing native plants.

Another tip sheet explaining how to create organic mulch illustrates how mulch improves the condition of the soil in backyards by improving root growth, increasing water infiltration, and providing a source of plant nutrients. Furthermore, the tip sheet asserts, mulch prevents weed growth, keeps fruits and vegetables cleaner, and keeps gardens from becoming mud pits during heavy downpours. The sheet also gives suggestions on mulch ingredients and how and when to apply mulch.

High Hopes

Campaign coordinators hope that the program will lead to the enhancement of one million backyards across the country by the year 2000. So far, more than 5,000 starter kits have been sold and more than 10,000 booklets have been requested. The campaign strives to foster a movement toward environmental volunteerism, encouraging homeowners to protect nature's resources at home while at the same time helping to beautify the landscape. Through the campaign, homeowners will gain a greater understanding of conservation and the importance of efforts, whether by farmers or city dwellers, to protect soil and water resources — bringing beauty and diversity to their own backyards at the same time.

Sign Up Your Backyard!

Participants can call 1-888-LAND-CARE to order a Backyard Starter Kit that contains a sign-up form, a 28-page color booklet outlining 10 conservation practices, a video showing the conservation practices, 10 tip sheets giving more detail on each practice, and a family fun pack.

The fun pack contains a four-page color guidebook with backyard ideas, a 3-D poster, the *Fun Backyard Board Game*, *Backyard Butterflies* educational comic book, and two children's activity books.

Only single copies are available free; bulk supplies can be ordered from NACD at 1-800-825-5547. The tip sheets can be downloaded from the NRCS web site: www.nrcs.usda.gov; just click on the Backyard Conservation button.

Starter kits are available at wholesale prices to any organization or business to distribute to customers. Two standup retail merchandising displays are also available.

Notes On Education

Los Angeles County Canines Hound Owners to Clean Up NPS

Living up to their reputation as trendsetters, Southern Californians last summer backed a first-of-its-kind pollution-prevention petition — signed by dogs. Over 150 canines showed up at an Encino pet store to pledge to "look after my owner and make sure he/she cleans up after me when we take a walk, or when I'm hanging out around the yard." The event was sponsored by CraZyDog Shampoo and the Petco chain of pet stores.

Attention to the water quality impacts of pet waste is increasing in urban communities across the country. In 1996, the Humane Society of the United States estimated that Americans owned nearly 53 million dogs. A large percentage of these pets live in cities and suburban areas, and environmental officials are now concerned that pet waste may be a significant component of urban NPS pollution.

"Animal waste, particularly from horses and dogs, is just one contributor to stormwater pollution," says Stephen Groner of the Los Angeles County Department of Public Works Environmental Division, which organized the Pet Pollution Prevention Pledge. "We're also targeting lawn pesticides, motor oil, and other contaminants that get into stormwater."

Seeking new ways to educate the public about coastal and inland nonpoint pollution, the county pinpointed pet owner behavior as ripe for change. Using a field called psychographics, the agency profiled various groups of residents, collecting information on attitudes, habits, and receptivity to change. "We asked how concerned they were about their neighborhoods," explains Groner. "We looked at several aspects. Where are residents creating the most problems, and who is most likely to change?" Dog owners rated high in both categories.

After targeting their audience, the agency reached out to them in several ways: working with the local animal shelter to make sure dog adopters received an informational packet about the problem, putting plastic bag dispensers in parks to make cleanup easy for pet owners, and handing out clean-up kits at dog events. Thousands of people are also getting the "scoop on poop" through a radio, newspaper, and billboard campaign.

The Pet Pollution Prevention Pledge was a cooperative public-private effort. "We approached Petco and CraZyDog about a partnership, saying we'd like to tackle this issue. We sat down and explained how it could have benefits for all — good publicity for the companies and a positive, proactive activity for us," Groner says.

In typical exuberant Los Angles style, the Pet Pollution Pledge event featured a pet psychic, human and canine celebrities, gourmet pet foods, and photos with "spokesdog" CraZyDog. Dogs signed the petition by dipping their paws into nontoxic ink. Afterwards, the signed petition was presented to city and county officials, along with a letter asking that they make pollution prevention a "pet project."

[For more information, contact Stephen Groner, Department of Public Works, Environmental Programs Division, 900 South Fremont Ave., Alhambra, CA 91803-1331. Phone: (626) 458-5947. Or contact Deirdre Allingham, Rogers & Associates, 1875 Century Park East, Suite 300, Los Angeles, CA 90067. Phone: (310) 552-6922. Or contact Larry James, CraZyDog Shampoo, c/o Fucini Productions. Phone: (248) 788-9155.]

Educational Resources Column

New York State Education Action Packet

The New York State Department of Environmental Conservation has created a packet of materials to help teachers and leaders of youth groups plan water education. To receive a packet or to get information about back issues of packets, contact Outreach Unit, NYSDEC Division of Water, 50 Wolf Road, Albany, NY 12233-3508. Phone: (518) 485-8743; e-mail: ehsmith@gw.dec.state.ny.us.

Educational Resources Column (continued)

New Adopt-A-Watershed Materials

Adopt-A-Watershed has released new and revised educational curriculum units.

- **Aquatic Ecosystems.** This new middle school unit focuses on wetlands or creeks. Students study ecosystems and habitats, and perform field studies to learn more about water quality.

- **Watershed Geologic History.** This new middle school unit enables students to learn and apply concepts such as erosion, weathering, faulting, and plate tectonics. Students discover how humans influence watersheds through their interaction with geologic processes.

- **Watershed Physics.** This new high school unit encourages students to understand how force and energy interact with matter to produce change in watersheds. Students organize studies in watershed geomorphology.

- **Animals.** This revised primary unit focuses on animals and their variations in size, shape, and color, as well as the use of specialized adaptations to improve their chances of survival in habitats as different as rocky ledges and muddy river bottoms.

- **Birds.** This revised intermediate unit teaches students about many of the birds found in our watersheds, their adaptations for survival, and their value as an integral component of watershed ecosystem.

- **Wildlife.** This revised middle school unit addresses the themes of evolution, patterns of change, and stability. Students perform an array of wildlife population studies including birds, amphibians, deer, and butterflies.

[For more information about these units, contact Adopt-A-Watershed, PO Box 1850, Hayfork, CA 96041. Phone: (530) 628-5334; web: www.pcoe.trinity.k12.ca.us/aau; e-mail: aaw@pcoc.trinity.k12.ca.us.]

Reviews and Announcements

Low-Impact Development Design Manual Released

Prince George's County, Maryland, has released a manual outlining the basics of the controversial low-impact development approach. With this manual, the county's Department of Environmental Resources hopes to stimulate debate and further exploration into the advancement of more economically and environmentally sustainable development communities.

The low-impact development approach uses micromanagement-level planning techniques to incorporate stormwater BMPs into landscaping plans for each developed parcel. This approach maximizes environmental protection from development impacts through reduction of clearing, use of existing grading, and use of forest- and habitat-enhancing techniques to protect ground water, streams, floodplains, and wetland areas. It combines an environmentally sensitive and functional site design with active public outreach and education, water conservation and reuse, and public/private partnerships.

[To order the $35 manual, contact Prince George's County Government, DER Programs and Planning, Attn: Larry S. Coffman, 9400 Peppercorn Place, Suite 600, Largo, MD 20774.]

Help for Wanna-Be Grantees

If you are applying for an EPA grant, the new EPA Grant-Writing Tutorial could make it a whole lot easier. Now on the Web at www.epa.gov/grtlakes/seahome/grants.html , this interactive software tool walks users through the grant-writing process and helps them learn to write more competitive grants.

Region 10 Displays Model Ordinances on Web

A number of model ordinances for source water protection can be accessed at www.epa.gov/r10earth/offices/water/swp.htm. Currently, the list includes ordinances from:

- New Hampshire Office of State Planning
- Massachusetts Department of Environmental Protection
- Oregon, Lancaster County (PA)
- Oklahoma Department of Environmental Quality
- Skagit County (WA)
- Hernando County (FL)
- Breward County (FL)

Biweekly Restoration Update Web Site

The restoration of aquatic corridors and wetlands is crucial to the restoration of natural watershed functions, one of the goals of President Clinton's Clean Water Action Plan. A new restoration update web site, maintained by EPA's Office of Wetlands, Oceans, and Watersheds, provides timely information on successful restoration projects and innovative partnerships. Part of the larger River Corridors and Wetlands Restoration Homepage (see *News-Notes* #50), the new web site is located at www.epa.gov/owow/wetlands/restore/update.htm and is refreshed website. It also includes information about funding sources, publications, and links to other restoration-related websites. A guest feature section promotes diversified views that hope to broaden and strengthen the linkage between restoration and other aspects of the ecosystem, our lives, and our society.

[For more information on river corridors or wetland restoration, contact John Pai, U.S. EPA (4501F), 401 M Street, SW, Washington, DC 20460. Phone: (202) 260-8076; e-mail: pai.john@epamail.epa.gov.]

Toward Sustainable Patterns of Growth for the 21st Century

The Chesapeake Bay Program has produced a 15-minute video highlighting six techniques to prevent sprawl patterns of development: urban boundaries, infill development, transit-oriented development, transfer of development rights, rural clustering, and traditional neighborhood development. The techniques are clearly explained with graphics and footage and are supported by interviews with local government officials, developers, and citizens.

[To order a copy or to request further information on the techniques discussed in the video, contact the Chesapeake Bay Local Government Advisory Committee, 416 Goldsborough Street, Easton, MD 21601. Phone: (410) 822-9630; fax: (410) 820-5039.]

EPA Issues New Guidance on Lakes and Reservoirs

EPA's supplemental guidance memo, *Guidance on Use of Clean Water Act and Safe Drinking Water Act Authorities to Address Management Needs for Lakes and Reservoirs*, emphasizes the eligibility of lake and reservoir restoration and protection activities under section 319 of the Clean Water Act. In addition, the guidance encourages the listing of impaired and threatened lakes and reservoirs on section 303 (d) lists prepared by states, tribes, and territories, and encourages greater use of the CWA State Revolving fund for implementing priority lake and reservoir management projects in approved state nonpoint source management programs. Finally, the guidance encourages states to use the Safe Drinking Water Act Source Water Assessment Program and the Drinking Water State Revolving Fund to protect and restore lakes and reservoirs which are used as drinking water supplies.

[A copy will soon be posted at www.epa.gov/owow/lakes/lakes.html. For more information, contact Anne Weinberg at (202) 260-7107.]

REFLECTIONS

Water Sheds Under Your Feet

by Ann Shackelford – Grade 8

The water under my feet moving fast to the street
flowing fast to the Anacostia, with all the trash,
sheds and puddles all in bubbles through the sewer
into the river, fast, fast, all the trash flowing right past
with all that I see and all that I saw I knew cleaning
the river would be a bore, we got together as a
team and started to clean, I looked around and
thought it was a dream I never thought the river would
get this clean, fast to the street water sheds under your feet

Ann Shackelford, an eighth grader from Stuart Hobson Middle School, Washington, DC, won the Anacostia Watershed (District of Columbia) award for the 1998 River of Words™ contest. On April 19, the 1998 winners of the annual international environmental poetry and art contest for children were announced by former United States Poet Laureate (1995-1997) Robert Hass, the contest judge and co-founder. The project seeks to help children discover their "ecological address" by exploring and interpreting their local watersheds (or natural landscapes). This year there were 14 grand prize winners and 34 finalists.

The deadline for next year's contest is February 15, 1999. To order a Teacher's Guide or other curriculum materials, contact River of Words Project, 1847 Berkeley Way, Berkeley, CA 94703. Phone: (510) 848-1155; fax: (510) 848-1008; e-mail: row@irn.org; website: www.irn.org.

Datebook

Datebook is prepared with the cooperation of our readers. To list a meeting or event in the Datebook, fax your information to (703) 385-6007, Attn: *NPS News-Notes*, at least two months in advance to ensure timely publication. This listing is available online at www.epa.gov/owow/nps/events.html and at www.epa.gov/owow/info/NewsNotes/index.html.

Meetings and Events

October 1998

1-3 — *Nonpoint Source: The Hidden Challenge*, Charleston, WV. Phone: 1-800-682-7866 or (304) 372-7880; fax: (304) 372-7887.

3 — *National Estuaries Day*, York River State Park, Gloucester Point, VA. Sponsored by the Chesapeake Bay National Estuarine Research Reserve System, York River State Park, and the Virginia Department of Conservation and Recreation. Contact Joyce Atkinson at (301) 713-3145, ext 145 or e-mail: jatkinson@ocean.nos.noaa.gov.

3-7 — *International Workshop on Public Participation*, Tempe, AZ. Seeks to promote and improve the practice of public participation in relation to governments, institutions, and other entities which affect the public interest in nations throughout the world. Contact the International Association for Public Participation. Phone: (800) 644-4273 or (703) 971-0090; e-mail: iap2hq@pin.org.

3-7 — *WEFTEC 98*, Orlando, FL. Contact Water Environment Federation, Attn.: WEFTEC 98 Program Coordinator, 601 Wythe St., Alexandria, VA 22314-1994. Phone: (800) 666-0206.

15 — *Sampson County Agri-Exposition*, Clinton, NC. This conference will focus on current water quality issues in the Cape Fear River Basin. Contact Glenda Dye, Mid-Carolina Council of Governments, P.O.

Drawer 1510, Fayetteville, NC 28302. Phone: (910) 323-4191, ext. 22; fax: (910) 323-9330; e-mail: glendad@mail.faynet.com.

20-21 *Agriculture and Water Quality in the Pacific Northwest— Understanding Each Other & Working Together for a Better Future*, Yakima, WA. Contact Agriculture and Water Quality Committee, PO Box 1462, Spokane, WA 99210. Phone: (509) 838-6653.

20-29 *River Restoration and Natural Channel Design*, Pagosa Springs, CO. One of eight short courses presented by Dave Rosgen with Wildland Hydrology. Contact Wildland Hydrology, 157649 US Highway 160, Pagosa Springs, CO 81147. Phone: (970) 264-7120; fax: (970) 264-7121; e-mail: wildlandhydrology@pagosasprings.net.

21-23 *State of the Lakes Ecosystem Conference (SOLEC)*, Buffalo, NY. SOLEC is a biennial conference to report and seek comment on progress toward the goals of the Great Lakes Water Quality Agreement. Contact Paul Bertram, U.S. EPA, at (312) 353-0153 or Nancy Stadler-Salt, Environment Canada, at (905) 336-6271. Further information can be found on the web at www.cciw.ca/solec or www.epa.gov/glindicator.

November 1998

9-11 *The Science of Managing Forests to Sustain Water Resources*, Worcester, MA. The conference will offer both research and application presentations on water quality and yield, silvicultural treatments, modeling, economic and social considerations, and international case studies. For more information, contact Jim Taylor, Metropolitan District Commission - Division of Watershed Management, 20 Somerset Street, Boston, MA 02108. Phone: (617) 727-5274; fax: (617) 727-8301; e-mail: jim.taylor@state.ma.us.

10-12 *Envirosoft 98 Development and Application of Computer Techniques to Environmental Studies*, Las Vegas, NV. Contact Sue Owne, Conference Secretariat, ENVIROSOFT 98, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO407AA, UK. Phone: 44(0)170-329-3223.

11-13 *18th Annual International Symposium of the North American Lake Management Society*, Alberta, Canada. Contact Symposium Program Co-chair Al Sosiak at (403) 678-9856; e-mail: asosiak@env.gov.ab.ca, or Everett Fee at (403) 678-9856; e-mail: (403) 678-9856.

11-13 *Environmental Mediation Training*, University of California Berkekey, CA. A three-day intensive course on "Facilitating and Mediating Effective Environmental Agreements." Contact CONCUR, Inc. Phone: (510) 649-8008; e-mail: concur@igc.apc.org; website: www.concurinc.com.

15-19 *1998 Annual Conference on Water Resources & Symposia on Management of Human Impacts on the Coastal Environment and Applications of Water Use Information*, Point Clear, AL. Contact AWRA, Attn: 1998 Annual Conference & Symposia, 950 Herndon Pkwy, Ste. 300, Herndon, VA 20170-5531. Phone: (703) 904-1225.

December 1998

6-10 *Hydrophobic Organic Compounds in Rivers*, San Francisco, CA. This conference will discuss innovative field technologies; quantitative techniques for investigating in situ partitioning of these compounds among water, biota, and sediment; and, creative applications of methods for interpreting multi-dimensional data sets. Contact Valerie Kelly (vjkelly@usgs.gov) or Kathy McCarthy (mccarthy@usgs.gov), USGS, 10615 SE Cherry Blossom Drive, Portland, OR 97216. Phone: (503) 251-3244; fax: (503) 251-3470.

Call For Papers DEADLINE

October 1 *National Watershed Coalition's Sixth National Watershed Conference*, Austin, TX, May 16-19, 1999. The theme of the conference is "Getting the Job Done at the Ground Level." To submit your abstract, prepare a 400 word or less description of your presentation, and indicate oral or poster. Include your name, address, phone, fax and e-mail numbers with your abstract and mail or fax to John W. Peterson, Executive Director, National Watershed Coalition, 9304 Lundy Court, Burke, VA 22015-3431. Phone: (703) 455-6886 or 4387; fax: (703) 455-6888; e-mail: jwpeterson@erols.com.

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