



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

Notes on the National Scene

President's Clean Water Action Plan Features NPS Control — A Clearer Path to Cleaner Water

Ambitious measures to cut polluted runoff are among the initiatives included in President Clinton's new Clean Water Action Plan. Unveiling the plan February 19, just four months after federal agencies led by EPA and USDA took on the task, the President said, "We must curtail the runoff from farms, from city streets, and from other diffuse sources that get into our waterways and pollute them. Every child deserves to grow up with water that is pure to drink, lakes that are safe for swimming, and rivers that are teeming with fish."

"I was pleased to be part of an amazingly collaborative effort between EPA, DOI, USDA, NOAA, DOD, and many others to develop this plan. The plan not only lays out a clearer path toward cleaner water, but provides new energy and proposes new resources to get there. States and tribes will be leading the way, supported by a strong, coordinated network of federal agencies," said Geoff Grubbs of EPA's Assessment and Watershed Protection Division.

Four broad elements form the plan's foundation: a watershed approach, strong federal and state standards, natural resources stewardship, and informed citizens and officials.

Watershed Approach Encourages State, Tribe, and Local Leadership

Reflecting the collaborative design of the team of federal agencies that developed the plan, the proposal emphasizes a watershed approach that makes troubled watersheds a priority. While state, tribal, and local governments will take the lead in assessing, restoring, and protecting their water resources; the federal government will provide much of the funding, including small grants to local communities and organizations.

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The Action Plan espouses over 100 actions that will directly benefit people and ecosystems including

- restoring 25,000 miles of stream corridors on public lands by 2005,
- achieving a net increase of wetlands — 100,000 acres per year — by 2005,
- establishing 2 million miles of conservation buffers on agricultural lands by 2002, and
- expanding coastal research, monitoring, and polluted runoff control programs.

Strong Standards

The Action Plan includes proposals for establishing federal nutrient criteria for nitrogen and phosphorus and new federal regulations on large feedlots, including some poultry operations. The national sweep of such regulations will provide a level playing field for states torn between tougher water quality laws and the prospect of losing agricultural enterprises (see box).

The federal government will also take an active role in protecting and restoring water quality on millions of acres of federal land. For example, the departments of Agriculture and the Interior will work together to develop a unified national federal policy to promote watershed protection in areas managed or overseen by the Forest Service, Fish and Wildlife Service, Bureau of Land Management, Bureau of Reclamation, and Office of Surface Mining.

In its first action under the Clean Water Action Plan, EPA released a draft strategy for minimizing the public health and environmental impacts from livestock feedlots. The strategy to reduce animal waste runoff calls for inspections, new water pollution control requirements, more technical assistance and research, and increased enforcement for large animal feeding operations. EPA invites public comment on the draft until May 1, 1998.

Copies of the draft animal feeding operation strategy may be obtained by calling (202) 260-7786. The strategy may also be reviewed at <<http://www.epa.gov/owm>>. Written comments may be sent to Ruby Cooper-Ford, U.S. EPA, 401 M Street, SW (4203), Washington, DC 20460 or e-mailed to <ford.ruby@epamail.epa.gov>.

EPA is also releasing a final enforcement strategy, which increases inspections based on environmental risk. EPA and states will inspect all high-priority operations within three years. Lower priority feedlots will be inspected within five years. States will not face the new enforcement measures alone, however. Along with increased enforcement, EPA plans to provide inspector training and other compliance support.

Copies of the final *Compliance Assurance Implementation Plan for Confined Animal Feeding Operations* may be accessed at <<http://www.epa.gov/OECA/agbranch.html>> or ordered by contacting Michelle Stevenson at (202) 564-2355.

Funding Increases

To achieve the plan's goals, the President's budget proposal calls for spending an additional \$568 million in fiscal year 1999 and a total of \$2.3 billion in additional funds over the next five years (subject to congressional approval). The plan proposes to increase NPS program (section 319) grants by \$95 million and other EPA clean water grants by \$20 million. If approved by Congress, the budgets would increase funding for USDA's EQIP program by \$100 million, NRCS program funding by \$20 million, and the Forest Service's fund for federal lands improvement by \$69 million. Other allocations are also expected:

- \$24 million to the Bureau of Land Management for improving water quality on federal lands,
- \$22 million for USGS monitoring and assessment programs,
- \$6 million to the Fish and Wildlife Service for use in wetlands restoration,
- \$5 million to the Bureau of Indian Affairs for water quality projects on tribal lands,
- \$11 million for the Army Corps of Engineers' wetlands program, and
- \$25 million for the Corps' Challenge 21 floodplain restoration initiative.

The budget proposal will also include \$22 million for NOAA, including \$12 million to help states complete their coastal NPS management plans. NOAA and EPA have been working together on the Coastal Nonpoint Program for seven years.

[For more information, or to access the Action Plan, visit <www.epa.gov/cleanwater> or <www.nhq.nrcs.usda.gov/cleanwater/>. To order copies of the Action Plan, call (800)490-9198.]

TMDL Policies Stress Action

"A Total Maximum Daily Load (TMDL) improves water quality when the pollutant allocations are implemented, not when a TMDL is established," declared Robert Perciasepe, EPA Assistant Administrator for the Office of Water, as he announced new TMDL policies last August. "When the state or EPA identifies a water quality impairment on a section 303(d) list and then

establishes the TMDL, we begin [the] water quality-based process, not end [it]," he pointed out in a memorandum to EPA Regional Administrators and Regional Water Division Directors. The policies are intended to help states meet the requirements of Clean Water Act section 303(d) and take needed actions to implement approved TMDLs.

The TMDL process begins when a state identifies and prioritizes specific waters in which problems are known to exist or are expected. States then set limits for pollutant loadings from the point and nonpoint sources for each listed water resource. EPA approves the state's list and TMDLs or sets the limits itself, if necessary. Point source reductions are implemented through National Discharge Elimination System (NPDES) permits. Federal, state, tribal, and local governments can employ a wide variety of authorities, programs, and initiatives (regulatory and nonregulatory) to reduce nonpoint source loadings.

The first part of the new policy directs each EPA Region to secure a specific written agreement with each state establishing a schedule for setting TMDLs for all listed waters. The schedules range from 8 to 13 years in most cases, and states are urged to integrate them with the Environmental Performance Partnership process (see *NPS News-Notes* #47). The schedules were due April 1, 1998, along with 1998 state lists of impaired waters.

According to the second part of the new policy, states should also submit plans for implementing the load allocations for listed waters that are impacted mainly by nonpoint source pollution. States may submit implementation plans to EPA as revisions to state water quality management plans, coupled with a proposed TMDL.

[For more information, contact Amy Sosin (4503F), U.S. EPA, 401 M Street SW, Washington, DC 20460. E-mail: <amy@epamail.epa.gov>. Or visit the TMDL web site <<http://www.epa.gov/OWOW/tmdl/index.html>>.]

EPA Releases National Inventory of Contaminated Sediment

The U.S. EPA's first national survey of sediment quality in the nation's waterbodies identified 96 watersheds (7 percent of those surveyed) where widespread sediment contamination poses potential risks to humans, fish, and wildlife. The survey revealed that while the majority of watersheds probably are safe, at least one station in nearly two-thirds of the watersheds examined is contaminated.

The *Incidence and Severity of Sediment Contamination in Surface Waters of the United States*, released January 7, confirms that "contaminated sediment is a significant problem in many watersheds around the country." EPA Assistant Administrator for Water Robert Perciasepe said, "The report underscores the need to finish the job of cleaning up our nation's waters and [preventing] their continued pollution."

Sediment Contamination a Nationwide Issue

According to the report, every state has some sediment contamination. The worst sites are clustered around large urban areas and industrial centers and in regions affected by agricultural and urban runoff. PCBs, mercury, and DDT are the most frequently found contaminants at the problem sites.

Although use of many of these substances has been banned or restricted for years, they can — and do — persist for extended periods in the sediment, binding to particles that fish ingest as they feed. The contaminants accumulate in fish and shellfish tissue and magnify in concentration up the food chain so that humans and wildlife consuming these fish can receive a health-threatening dose. Most of the human health risks from these chemicals come from repeated exposure over time, rather than from single acute poisonings.

Subsistence and recreational fishers who eat large quantities of contaminated fish may be at increased risk of reproductive cancer and neurological impairment. More than two-thirds of the watersheds named in the report as "areas of probable concern" already have active fish consumption advisories in place.

Risk-based Results

To assess the nation's overall sediment quality, EPA assembled the largest set of sediment chemistry and related biological data ever compiled into a database called the National Sediment Inventory. EPA examined approximately two million records from more than 21,000 inland, coastal, and marine sampling stations located in 65 percent of the 2,111 watersheds in the continental United States.

The data, which were collected between 1980 and 1993, provide a baseline for future studies and for setting clean-up and pollution prevention priorities, EPA researchers noted.

After compiling the data, EPA assigned each sampling station to one of three levels:

- Tier 1 — adverse effects are probable (26 percent of the sampling stations fall into Tier 1)
- Tier 2 — adverse effects are possible but expected infrequently (49 percent)
- Tier 3 — no indication of adverse effects (25 percent)

This distribution, while highlighting a large number of contaminated locations, also reflects the emphasis that monitoring programs place on areas known or suspected to be contaminated, said EPA. Because contamination is most significant if it occurs widely within a discrete area, EPA classified a watershed as an "area of probable concern" if it contained 10 or more Tier 1 sampling stations and if 75 percent or more of all the sampling stations in that watershed were classified as either Tier 1 or Tier 2. On this basis, 96 of the assessed watersheds are sufficiently contaminated to pose potential risks.

Point and Nonpoint Sources

Sources of contaminated sediments include incineration emissions, which travel by air to water before being deposited in sediments; discharges of toxic and hazardous pollutants in wastewater; and urban and agricultural runoff.

EPA has established four goals to guide future efforts to manage contaminated sediment: (1) prevent the volume of contaminated sediment from increasing; (2) reduce the volume of existing contaminated sediment; (3) ensure that sediment dredging and dredged material disposal are managed in an environmentally sound manner; and (4) develop scientifically sound sediment management methods.

Recommendations stemming from the study include

- further evaluating the areas of probable concern,
- incorporating a weight-of-evidence approach and measures of chemical bioavailability in future sediment monitoring,
- banning or restricting the use of toxic substances,
- strengthening water quality standards and permits, and
- cleaning up contaminated sites using Superfund and other enforcement authorities.

Cleaning up in-place contaminated sediments can be a complicated and expensive task, with costs totaling in the millions if the contamination is extensive and removal and treatment are required. Besides dredging, capping with clean sediment or natural recovery by deposition of clean sediment over time are options, depending on the case. To help make sound, risk-based decisions, EPA and others are developing and advocating the use of various sediment quality assessment methods, including toxicity and bioaccumulation tests, biological community indices, and numerical chemical concentration guidelines.

The report, prepared at the request of Congress under the Water Resources Development Act of 1992, was written in consultation with the National Oceanic and Atmospheric Administration; the Army Corps of Engineers; and other federal, state, and local agencies. EPA expects to look more closely at the 96 worst locations and to revisit the nation's sediment status in 2000.

[For more information, contact Jim Keating (4305), U.S. EPA, 401 M Street, SW, Washington, DC 20460. Phone: (202) 260-3845; fax: (202) 260-9830; e-mail: keating.jim@epamail.epa.gov. Copies of EPA's fact sheet (EPA 823-F-98-001) or the three-volume report: The Incidence and Severity of Sediment Contamination in Surface Waters of the United States (EPA 823-R-97-006, 007, and 008) are available from the U.S. Environmental Protection Agency, National Center for Environmental Publication and

Task Force Examines Hypoxia in the Gulf of Mexico

Environmental activists, commercial fishers, and scientists warn that a 6,000-square-mile hypoxic zone just off the coasts of Louisiana and Texas is disrupting the area's economy as well as its aquatic ecosystem. A task force of high-level officials from the states, tribes, and federal agencies is beginning to address the widening area of hypoxia in the Gulf of Mexico.

The Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, which met for the first time last December, is combining expertise, authorities, and programs to better characterize hypoxia, and to coordinate implementation of existing programs that will provide solutions.

Sediment core samples reveal that nitrogen loads to the Gulf, which are thought to be the root of the problem, have tripled since the 1950s. Data now show that the hypoxic zone grew substantially after the pulse of runoff from the 1993 Mississippi floods. Even in years of normal rainfall, huge loads of fertilizers, animal manure, decaying plants, municipal and domestic wastes, and atmospheric deposition enter the river from its giant 31-state drainage basin. The National Oceanic and Atmospheric Administration estimates that 90 percent of the Gulf's nutrient load comes from nonpoint sources. The loss of natural wetlands and riparian vegetation throughout the watershed exacerbates the problem.

Gulf of Mexico/Mississippi River Watershed Task Force Members

Federal Agencies

- Department of Agriculture
- Environmental Protection Agency
- Department of Interior
- Department of Justice
- National Oceanic and Atmospheric Administration
- Department of the Army

State Agencies

- Illinois Agriculture and Land Stewardship Department
- Illinois Department of Agriculture
- Louisiana Environmental Quality Department
- Minnesota Pollution Control Agency
- Wisconsin Department of Natural Resources
- Mississippi Department of Environmental Quality
- Missouri Department of Natural Resources
- Tennessee Department of Agriculture
- Arkansas Soil and Water Conservation Commission

Tribal Organizations

- Prairie Island Indian Community
- Mississippi Band of Choctaw Indians

Ecosystem Disruption

The hypoxic zone results from physical, chemical, and biological interactions that occur where the Mississippi River's nutrient-rich freshwater hits the salt water of the Gulf. The excessive nutrients feed algae blooms that deplete oxygen in the Gulf's deeper waters as they decompose. The sharp temperature gradient that occurs in the spring and summer between upper and lower waters prevents oxygen-poor deep water from mixing with the oxygen-rich shallow water. Gulf oxygen levels, which should be about 5 parts per million or higher, have dropped below 2 parts per million in the hypoxic zone and to zero in areas known as "dead zones."

Though the problem begins in deep waters, its effects echo throughout the water column. Shellfish and other bottom-dwellers suffocate. Fish move out of the zone in search of food and oxygen. And the ramifications of such profound ecosystem changes extend beyond the water's edge.

The hypoxic zone centers squarely in the middle of one of the most important fisheries in the United States, an area that produces 40 percent of the country's commercial fish and shellfish. In Louisiana, commercial fishing supports 90,000 jobs and has an economic impact of \$1.5 billion. In 1991, the state's recreational fishers spent about \$600 million.

To compensate for ecological changes wrought by hypoxia, Gulf fishing boats are now moving farther out to sea to reach the shrinking fishery, spending more for fuel, supplies, and wages. Others drop their nets closer to shore, causing localized overfishing of the near-shore areas.

Under the auspices of the White House Committee on Environmental and Natural Resources, a team of scientists is preparing to report to the Task Force on the results of six scientific assessments:

- Characterization of hypoxia: its distribution, dynamics, and causes
- Ecological and economic consequences of hypoxia
- Sources and loads of nutrients to the Mississippi River and the Gulf of Mexico
- Effects of reducing nutrient loads to surface waters within the basin and Gulf
- Evaluation of methods to reduce nutrient loads to surface water, ground water, and the Gulf
- Evaluation of social and economic costs and benefits of methods identified to reduce nutrient loads.

The assessments will be reviewed by independent experts and delivered to the Task Force later this year.

University Sets Up Hypoxia Research Center

A new research center to study hypoxia in the Gulf of Mexico has opened at Iowa State University. Illinois is one of the largest contributors of nutrients to the Mississippi River Basin. Researchers estimate that 10 to 15 percent of the nitrates entering the river come from Illinois.

The new Agro-Oceanic Nutrient Flux Center, or "Turf & Surf," will attempt to summarize and focus the immense and diverse knowledge base, identify and fill important research gaps, and build support for and implement nutrient management methods in the agricultural, coastal, business and political communities of the rural Mississippi Basin and Gulf of Mexico. The center's web address is <<http://www.public.iastate.edu/~turf2surf/>>.

The Public Speaks Out

About 70 members of the general public attended the December meeting to listen, comment, and ask questions. Several called for increasing the pace of finding viable solutions to the problem and establishing goals and deadlines similar to the Chesapeake Bay Program's 40-percent reduction goal for nutrients. The need for broader participation was another prominent theme emphasized by commenters. Darryl Malek-Wiley, president of the Mississippi River Basin Alliances suggested that the Task Force be expanded to "bring other nongovernmental organizations to the table and have everyone talking as equals."

The group met again on April 8 to discuss the status of the new Clean Water Action Plan (see article on page 1) and how it might influence responses to the hypoxia problem, what kinds of goals or objectives to set, how to manage the coordination and implementation of activities, and how the Task Force will measure and track progress.

[For more information, contact Mary Belefski (4503F), U.S. EPA, Watershed Branch, 401 M Street, SW, Washington, DC 20460. Phone: (202)260-7018; fax: (202) 260-1977; e-mail: <belefski.mary@epamail.epa.gov>.]

Notes on Watershed Management

Unexpected Findings — Tampa Bay Investigates Atmospheric Deposition

Seven years ago, scientists and watershed managers in the Tampa Bay area described the contribution of pollutants from atmospheric deposition to the Bay as "unknown, but thought to be of minor importance." Today's more precise methodology, however, indicates that the atmosphere is the largest source of phosphorus input to the Bay, and the second largest source of nitrogen. The unexpected finding has spurred research into the impacts of air quality on the Bay.

Preliminary results of the Tampa Bay Atmospheric Deposition Study (TBADS) provide evidence of more than one conduit for airborne nutrients entering the Bay. Approximately 29 percent of the nitrogen and 31 percent of the phosphorus entering Tampa Bay are deposited directly on the water surface. Compounding the problem are atmospheric contaminants washed into the Bay by runoff. By the time the study is completed (in several years), researchers hope to know the extent of water quality impacts from both routes and the identity of the sources of nitrogen and toxic materials in atmospheric deposits to the Bay. Some of the issues that researchers expect to

clarify include the relative contribution of various nitrogen forms, dry vs. wet deposition, atmospheric deposition delivery via stormwater, and the relative importance of local and regional sources of atmospheric nitrogen.

Dry vs. Wet Deposition

Preliminary data from intensive monitoring of both types of deposition indicate that dry deposition is far more common than wet deposition. About 80 percent of airborne pollutants are introduced to the Bay waters by settling and attaching to surfaces. Gaseous components of sulfur oxides, nitrogen oxides, and ammonia and salts of either cations or anions are elements of dry deposition.

In wet deposition, rain, snow, ice or cloud droplets combine with pollutants and fall as precipitation. Pollutants include various types of acids (for example, sulfuric and nitric acids) and some cations.

Different methods are used to assess the loading from the two types of deposition. Wet deposition requires only a straightforward measurement of the amount of nitrogen in the precipitation. Accounting for dry deposition is much more complex, since dry deposition processes are influenced by the type of surfaces available for attachment and other factors including aerodynamics and dew fall. After the ambient nitrogen concentration is measured, the portion likely to be deposited is estimated, and a model based on meteorological data is applied.

Remote vs. Local Sources

When the bulk deposition rates of nitrogen, phosphorus, and some toxics (mainly metals and pesticides) were measured at seven stations in the Tampa Bay watershed, the results showed that nitrogen is relatively evenly distributed throughout the watershed, which suggests sources outside the watershed. Atmospheric deposition of pesticides, on the other hand, appears to come from local agricultural sources, such as crop dusting or plowing.

To better understand the mechanics of local vs. remote sources of airborne pollutants, TBADS and EPA's Office of Research and Development are developing a model of air mass movement featuring 15 different weather scenarios. Over the next year, the Florida Department of Environmental Protection plans to use the model to track emissions in the Tampa Bay area, to predict, for example, whether emissions from watershed power plants lead to deposition in the Bay. The model, similar to one developed for the Chesapeake Bay area, will also reveal whether air masses are delivering pollutants from outside the watershed.

Another TBADS goal is to determine how much atmospherically deposited nitrogen is immediately available for biological uptake. Living organisms can use nitrogen only if it is packaged in a biologically recognizable form such as ammonia (NH_3) and particulate ammonium (NH_4^+). TBADS scientists are monitoring six locations to determine exactly how much nitrogen is actually available to support algae growth in the bay.

Stormwater Also a Source

In addition to pollutants from the "airshed" deposited directly onto the Bay's surface, the watershed makes its own contribution of pollutants deposited on land and carried in runoff to the Bay's tributaries. To determine the contribution of atmospheric deposition to stormwater quality, nitrogen and phosphorus data are being gathered in three residential areas in the watershed. These studies should be completed this spring. According to Holly Greening of the Tampa Bay National Estuary Program, researchers hope to expand monitoring to other land use areas (urban and agriculture) and perhaps include metals and other toxic parameters.

TBADS researchers are also seeking to determine the role atmospheric deposition plays in the formation of several "hot spots" of sediment contamination in the Bay — that is, whether these contaminants are from direct atmospheric deposits or from stormwater runoff.

Controlling nitrogen input to Tampa Bay is essential if the Tampa Bay National Estuary Project hopes to meet its goal of restoring sea grasses to levels that existed in the 1950s. Studies show that of the 15,000 acres that have been lost since that time, about 12,000 acres can be recovered if

Partners in the Tampa Bay Atmospheric Deposition Study

- Tampa Bay National Estuary Program
- Florida Department of Environmental Protection
- Florida Department of Transportation
- Southwest Florida Water Management District
- Hillsborough, Pinellas, and Manatee counties

current nitrogen levels are reduced 7 percent by 2010. Controlling atmospheric deposition will play a large role in achieving that goal, since nutrient-fueled algae blooms block sunlight to the grasses.

TBADS is showing that, in Tampa Bay at least, thinking on a "watershed" level is no longer enough; the airshed (often a much larger area) can significantly impact watersheds that are thousands of miles from the pollutant source. Both point sources and nonpoint sources contribute to the atmospheric pollution brew, making control a challenging job for all airshed and watershed partners.

[For more information, contact Holly S. Greening, Tampa Bay National Estuary Project (I/NEP), 100 Eighth Avenue, SE, St. Petersburg, FL 33701. Phone: (813) 893-2765; e-mail: <tbnep@tampabayrcp.org>.]

Scientist Links Nutrient Runoff with Forest Defoliation

Adapted from *U.S. Water News*, January 1998, Vol. 15, No. 1. Co-published by U.S. Water News, Inc. and the Freshwater Foundation.

As recent initiatives to preserve and create forested buffers along the Chesapeake Bay get underway, data supporting the water quality benefits of forests continue to mount. Hydrologist Keith Eshleman of the University of Maryland Center for Environmental Science has received a \$698,000 federal grant to investigate his discovery that nitrogen runoff from forest land in the Chesapeake Bay watershed soared to as much as 50 times normal after heavy defoliation by gypsy moth caterpillars.

The project is aimed at quantifying the overall effect of various kinds of forest disturbances (including defoliation by insects) on the nitrogen load to receiving rivers, streams, and ultimately the Chesapeake Bay. Using existing data, Eshleman plans to estimate how much of the 230 million pounds of nitrogen believed to enter the bay annually comes from forest land — and how much that figure changes when forests are disturbed.

The data come from previous studies of defoliation and dissolved nutrients in streams within the bay watershed, where forests make up 60 percent of the land cover. In addition, a GIS-linked model of the effects of defoliation on nitrogen runoff will be developed, tested, calibrated, and applied to the regional data sets. "No one has taken the time to pull all these data together to be able to apply it to the question of how the regional forest is affecting the Chesapeake Bay," said Eshleman, who works at the Center's Appalachian Laboratory in Frostburg, Maryland.

Forests normally accumulate nitrogen in plants and soil layers, so the amount reaching the bay from forest land usually amounts to only a few pounds per acre, he said. But during a peak of defoliation in 1990, researchers found that dissolved nitrogen levels in some forest streams were similar to those in agricultural areas, which are often high in nutrients from fertilizer.

Eshleman thinks the heavy nitrogen discharge from defoliated forests in western Maryland is also linked to caterpillar droppings, which, like all animal waste, are high in nutrients. Gypsy moth caterpillars chomped through millions of acres of hardwood forests in the bay watershed during the late 1980s and early 1990s. At the peak of the infestation, close to 12 percent of the watershed's forests were stripped bare, Eshleman said. Gypsy moths have largely disappeared from the watershed in recent years, but scientists think they will return. Other forest disturbances, such as clear-cutting and overbrowsing by deer may also increase nitrogen runoff.

"I don't want to diminish the importance of . . . pollution from agricultural land — it is clearly an important contributor to nitrogen loading of the Chesapeake Bay," Eshleman said. "But people shouldn't get the impression that if you live on the farm, you're the sole source of the problem."

Chesapeake Bay Foundation Vice President Michael Hirshfield said Eshleman's work shows the value of healthy forests to the watershed ecology. "It confirms our understanding that just about the most valuable thing you can have covering the landscape from a pollution perspective is forests," he said.

News from the States

States Investing in Water Quality — Getting Habitat Dividends in Return

Nonpoint source control and habitat enhancement are a natural match for states seeking to combine objectives and funding sources in their environmental projects. Three current projects illustrate the potential for this type of pairing — a planning technique that more and more states are adopting to leverage additional benefits from scarce resources.

SRF Funding Framework Workshops: Integrating the SRF into the States' Water Quality Programs

EPA regional offices are hosting workshops to improve the use of the Clean Water State Revolving Fund. The SRF has over \$24 billion in assets available for loans to fund a wide variety of water quality projects, including agricultural BMPs, urban stormwater controls, wetlands and riparian zone restoration and protection, estuary projects, and ground water protection. For more information, see <<http://www.epa.gov/OWM/fagen.htm>>.

The interactive workshops will bring state water quality representatives from nonpoint source, wetlands, estuary, watersheds, groundwater, and SRF programs together to share ideas and learn about each other's programs.

If you are interested in participating, please contact your regional SRF representative:

Region 1

(CT, ME, MA, NH, RI, VT)
June 1998
Ralph Caruso
(617) 565-3617

Region 4

(AL, FL, GA, KY, MS, NC,
SC, TN)
August 1998
Sheryl Parsons
(404) 562-9337

Region 5

WI, IL, IN, MI, MN, OH,
Various locations/times
Gene Wojcik
(312) 886-0174

Region 6

(AR, LA, NM, OK, TX)
Late June 1998
Velma Smith
(214) 665-7153

Region 7

(IA, KS, MO, NE)
September 1998
Donna Moore
(913) 551-7741

Region 8

(CO, MT, ND, SD, UT, WY)
September 1998
Brian Friel
(303) 312-6277

Region 9

(AZ, CA, HI, NV, AS, GU)
September 1998
Juanita Licata
(415) 744-1948

Region 10

(AK, ID, OR, WA)
Call for dates
Dan Steinborn
(206) 553-2728

**may be combined*

■ Ohio's Brush Creek Project — SRF Funding Buys Conservation Easement

The Ohio Environmental Protection Agency recently awarded The Nature Conservancy a \$110,000 loan to buy easements on 154 acres along Ohio Brush Creek in southern Ohio. The money came from the State Revolving Fund (SRF) and marks the first time an SRF loan has been used in the purchase of a conservation easement. It is also the first time The Nature Conservancy has obtained SRF financing for stream restoration and protection.

Ohio Brush Creek is known for four endangered aquatic species, including the club shell mussel. The easement property will protect 1.5 miles of the creek's main trunk and provide a buffer to the Edge of Appalachia Preserve, a system managed by The Nature Conservancy. The easement will allow the property owners to place permanent restrictions on land uses.

"Conservation easements are an effective way to protect the quality of streams and their adjacent areas," said Ohio EPA Director Donald R. Schregardus. "Restoring and preserving these riparian areas is an important part of controlling contaminated runoff that threatens water quality and stream habitat. The SRF loan is an assistance tool for protecting and preserving Ohio's water resources. We hope other state and local organizations will consider using the loan program in their areas to help protect our waterways."

Through EPA, the SRF program provides seed money to states to distribute as "reusable" loans to various groups for water quality projects. Groups applying to states for SRF funds must prove their ability to return the money. In the last nine years, over \$17 billion has been loaned. About 97 percent of the funding supported wastewater treatment projects. The other 3 percent went to nonpoint source and estuary projects.

The Nature Conservancy loan, from the state's Water Pollution Control Loan Fund, will be repaid over a five-year period at an interest rate of 3.2 percent. The Water Pollution Control Loan Fund is jointly administered by Ohio EPA and the Ohio Water Development Authority.

[For more information about the U.S. EPA's SRF program, contact Nikos Singelis (4204), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC. 20460; e-mail: <singelis.nikos@epamail.epa.gov>. For information about the Ohio Brush Creek project, contact Jerry Rouch, Ohio Environmental Protection Agency, P.O. Box 1049, 1800 Watermark Drive, Columbus, OH 43216-1049. Phone: (614) 644-2798. Or contact Jeff Knoop, The Nature Conservancy, 6375 Riverside Drive, Suite 50, Dublin, OH 43017. Phone: (614) 717-2770.]

■ **Wisconsin Buffers Serve Dual Purposes** Otter Creek in Sheboygan County, Wisconsin, provides an excellent example of the multiple benefits of streambank buffer strips and the role of local citizens in improving water quality. Using \$20,000 donated by the Southeast Wisconsin Chapter of Pheasants Forever, the county department of conservation is planting riparian buffers that double as pheasant habitat between agricultural lands and the creek.

The Sheboygan County Land Conservation Department inventoried riparian habitat along the creek in 1996 as part of the Sheboygan River Priority Watershed Project. Although landowners had taken action to help control farm runoff and upland erosion, the inventory showed that streambank vegetation would complement those upland conservation measures by providing additional water quality protection and creating and enhancing wildlife habitat, especially needed pheasant habitat.

Estimating that the land would produce crops worth \$100 per acre if farmed, the Conservation Department agreed to compensate farmers for that amount annually for the next 10 years. Nearly 20 acres were planted as buffers ranging in width from 16 to 95 feet. Based on Iowa State University sediment removal studies, Conservation Department officials estimate that the new buffer strips could reduce sediment delivery to Otter Creek by as much as 40 percent.

Otter Creek is also one of 22 sites included in a national EPA-funded monitoring program that collects data on water quality, stream habitat, aquatic insect and fish populations, and land use to determine the effectiveness of BMPs in the watershed. Working side-by-side, the two projects should produce a well-managed stream corridor that supports an abundance of wildlife.

[For more information, contact Jason Knuth, Sheboygan County Land Conservation Department, 650 Forest Avenue, Sheboygan, WI 53085-2513. Phone: (920) 467-5746.]

■ **Marsh Restoration Project Progressing in California** In California, the 57,310-acre Suisun Marsh, unique for its size and diverse wildlife amid increasingly urban surroundings, is undergoing restoration that will improve endangered species habitat and enhance NPS pollutant filtering as a secondary benefit. One of the largest brackish water marshes in the country, Suisun represents about 12 percent of all remaining natural marshland in California. The project is funded by a North American Wetlands Conservation Act (NAWCA) grant and is the largest NAWCA project ever attempted.

The restoration, which involves nearly half the marsh's acreage, includes the restoration and enhancement of wetlands and the installation of five fish screens. Because the tidal marsh was diked in the late 1800s for agricultural purposes, restoration also involves improved water delivery systems, drainage facilities, and water control structures. To pay for it, project partners matched a \$1 million NAWCA grant for a total of \$2.86 million. Work began in August 1997 and will be completed by late summer 1998.

The marsh is home to a number of endangered species — the saltmarsh harvest mouse, California clapper rail, winter run Chinook salmon, delta smelt, Sacramento split tail minnow, and several plant species. Many more common migratory and resident waterfowl, fish, and other wildlife species also populate the wetland.

Partners

- ✓ Suisun Marsh North American Wetlands Conservation Act Project
- ✓ U.S. Army Corps of Engineers
- ✓ San Francisco Bay Conservation and Development Commission
- ✓ California Regional Water Quality Control Board
- ✓ State Lands Commission
- ✓ California Department of Fish and Game
- ✓ U.S. FWS Endangered Species Branch
- ✓ U.S. FWS Wetlands and Contaminants Branch
- ✓ National Marine Fisheries Service
- ✓ Ducks Unlimited
- ✓ Suisun Conservation Resource District
- ✓ California Department of Fish and Game
- ✓ U.S. Department of the Interior
- ✓ North American Wetlands Conservation Council
- ✓ private landowners

The area's human residents also benefit since Suisun Marsh's San Francisco Bay location is within a two hour drive from densely developed suburbs and cities. Over 15,000 acres owned by the state fish and game department are open to the public, and many privately owned portions of the marsh support activities like hunting and fishing.

[For more information, contact Mike Bias, Regional Biologist, Ducks Unlimited, 3074 Gold Canal Drive, Rancho Cordova, California 95670-6116. Phone: (916) 852-2000; fax (916) 852-2200. Or contact Steve Chappell, Biologist, Suisun Resource Conservation District, 2544 Grizzly Island Road, Suisun, CA 94585. Phone: (707) 425-9302.]

States Up the Ante to Protect Riparian Areas

By Barry Tanning, Environmental Policy Analyst, Council of State Governments

While most states are still banking on voluntary measures to reverse streambank degradation and NPS-impacted water quality, others are starting to take more aggressive action.

■ **Massachusetts** Massachusetts recently finalized regulations for implementing its new Rivers Protection Act, which establishes a 200-foot-wide buffer zone along the state's perennial rivers and streams. Developers who wish to build in the zone must demonstrate that there is no reasonable alternative to construction in the protected area. They must also outline how their proposed project will minimize impacts related to flooding, water supply, ground water, shellfish, aquatic habitat, storm drainage, and fishing.

Convened by the Massachusetts Department of Environmental Protection, an eight-member advisory board drafted the River Protection Act regulations. Board members included environmental advocates, farming interests, property owners, developers, and real estate interests. State officials hope that the new law will address most of the state's water resources (nearly 67 percent) that are currently listed as impaired, and will promote a more proactive approach to protecting water quality.

■ **North Carolina** North Carolina adopted a riparian protection measure last June, when Governor Jim Hunt, members of the Environmental Management Commission, North Carolina Department of Environment, Health and Natural Resources Secretary Jonathan Howes, and state legislators teamed up on a plan to reduce nitrogen pollution and riparian destruction along the Neuse River. The plan, announced after exhaustive research and consensus-building, established a 50-foot protected, vegetated zone on each side of the river. Tough new rules for stormwater management in urban areas, fertilizer applications, and sewage treatment plant discharges were also enacted to reduce the amount of nitrogen and phosphorus polluting the river.

■ **New Hampshire** Not to be outdone by its neighbors to the south, New Hampshire implemented a comprehensive shoreland protection act last year to manage activities within 250 feet of lakes, ponds, rivers, and coastal waters. The new shoreland rules are targeted at maintaining effective buffers of trees, shrubs, and ground cover to filter and absorb pollutants and runoff. A minimum 20-foot setback is required for construction of sheds, garages, or other structures, with a mandatory maximum "footprint" set at 150 square feet. Coordinated review of riparian activities will eliminate unplanned and piecemeal development in the state, according to Department of Environmental Services Commissioner Robert W. Varney.

■ **Illinois** Finally, Illinois sweetened the pot for voluntary protection of riparian areas by adopting a five-sixths property tax exemption for vegetated buffers managed in accordance with a plan approved by the county conservation district. The protected zone must be at least 66 feet wide, meet NRCS standards, and contain vegetation that "has a dense top growth, forms a uniform ground cover, has a heavy fibrous root system, and tolerates pesticides used in the farm field."

[For more information, contact Barry Tanning, Environmental Policy Analyst, Council of State Governments, P.O. Box 11910, Lexington, KY 40578-1910. Phone: (606) 244-8228; fax: (606) 244-8239; e-mail: <btanning@csg.org>.]

Agricultural Notes

Conservation Tillage Acres Outnumber Conventional Agriculture Acres

For the first time, conservation tillage systems were used on more U.S. crop acres than intensive tillage systems, according to a report on the National Crop Residue Management Survey. Iowa, Illinois, South Dakota, Kansas, and Indiana together accounted for five million of the 6-million acre increase in environmentally friendly farming techniques.

Conservation tillage systems now account for 109.8 million acres, or 37 percent, of the 294.6 million acres of crops planted annually in the United States. Traditional farming methods, which cause more soil erosion and runoff, declined by four million acres to 107.6 million acres. (A system called reduced-till accounts for the other 77.3 million acres of cropland planted in 1997.)

Residue Management MAXes Out

Farmers across the Corn Belt, using a tool called MAX (Farming for MAXimum Efficiency) to compare the profitability of different types of tillage systems, are finding that the yields and profits produced through conservation tillage practices compare very favorably to yields gained through conventional tillage.

During the growing season, farmers record data on fertilizer and pesticide applications, field operations, and other expenses. Local conservation agency personnel add erosion control and soils information. All the data, including harvest results, are entered into the MAX computer program to generate summary reports that offer growers economic insight on inputs and management. The program also ranks fields in the watershed or area by yield-per-acre or cost-per-bushel, so growers can compare their results with other local fields and consider ways to fine tune their production system for the future.

Farmers can download the free MAX software from the Internet: <<http://www.ctic.purdue.edu>>; order it on a disk; or use hard copy worksheets.

[For more information, contact Dan Towery, Conservation Technology Information Center (CTIC), 1220 Potter Drive, Room 170, West Lafayette, IN 47906-1383. Phone: (765) 494-9555; fax (765) 494-5969.]

Conservation tillage is, by definition, any tillage or planting system that leaves 30 percent or more of the soil surface covered with crop residue (e.g., leaves, stems, stalks) after planting. In addition to reducing soil erosion from water and wind, crop residues help keep nutrients and pesticides from washing off the field. The leftover plant matter acts like a series of tiny dams to hinder runoff, allowing more infiltration and less overland flow into streams and rivers. "Independent research and practical application across the country show that these systems not only replenish and build organic matter in the soil for improved future food productivity but they also protect water quality and enhance wildlife and the environment for future generations," said John Hebblethwaite, executive director of the Conservation Technology Information Center.

Conservation Tillage and the Multiplier Effect

Farmers using conservation tillage make fewer trips through fields, saving money, time, fuel, labor, and machinery (by reducing wear). Improved long-term productivity, higher soil moisture, decreased soil compaction, better wildlife habitat, improved soil tilth, natural protection of ground water, and even clean air are other benefits of conservation tillage.

USDA Natural Resources Conservation Service and soil and water conservation districts gathered the data for the National Crop Residue Management Survey. CTIC then compiled and published the report, which may be purchased from CTIC. Highlights or an executive summary are available free. To order, call CTIC at (765) 494-9555 (or see box for CTIC address and fax number).

Urban Notes

Smart Growth — An Imperative for the Future

By Michael Bettaker, Principal Environmental Engineer, Tetra Tech

Achieving a balance among the issues of economic growth, community livability, and environmental protection is an objective that the U.S. EPA has fostered for a number of years. Now labeled "smart growth," this goal is increasingly embraced by land use planners and progressive developers. Many are concluding that we cannot continue endless development without regard to its impacts on the environment.

In this spirit, EPA and the Urban Land Institute (ULI) cohosted the Partners for Smart Growth Conference that took place December 2-4, 1997, at the Renaissance Harborplace Hotel in Baltimore, Maryland. Attended by over 700 people, the conference was a major event in a national reevaluation of land development practices focusing on meeting community and regional needs with development and redevelopment that is environmentally sensitive, economically sensible, and fiscally sound.

The conference marked a turning point in how federal, state, and local governments and developers view development. The teaming of ULI and EPA is a significant milestone. EPA, particularly the water office, has historically supported sustainable growth. ULI is a nonprofit education and research institute for developers and homebuilders that is creating alternatives to sprawling suburban growth.

Growth may be inevitable, yet, as the conference revealed, the impacts of uncontrolled, endless growth are becoming impossible to ignore. Degraded water supplies, diminishing biodiversity, air pollution, transportation bottlenecks, and crime are linked to overdevelopment.

At the conference, Maryland Governor Parris Glendening challenged others to follow his state's smart growth initiative, which directs state aid toward existing cities and towns, thereby reducing the expansion of roads, sewers, and schools into rural lands. The goal, Glendening said, is not "no growth" or even "slow growth." It is, rather, "sensible growth that balances our need for jobs and economic development with our desire to save our natural environment before it is forever lost."

Baltimore Sets Example of Urban Renewal

Heard often during the conference was a call for renewing deserted and decaying urban centers. Baltimore, the conference's host city, is a good example. The city center is undergoing a renaissance with the construction of the Convention Center, National Aquarium, and, of course, Camden Yards, home of the Orioles. The renewal has drawn people and businesses back to the city, promoting an alternative to suburban growth.

Another urban renewal project of note presented at the conference was the Charlotte, North Carolina, South End-Wilmore Brownfield Project, which cleaned up contaminated land and put it back into beneficial use. In 1996, the city of Charlotte used a \$200,000 EPA grant to identify environmental problems and create opportunities for private sector and bank participation in brownfield redevelopment. The project's accomplishments far exceeded its goals; it helped five private renovation projects during its first year alone, winning an award for its outreach, and playing a significant role in drafting North Carolina's Brownfield Property Reuse Act, signed by the Governor in 1997.

Prince George's County, Maryland, presented its concept of "low impact development," an alternative to conventional land use practices. The challenge of complying with the numerous and complicated environmental regulations of different agencies led the county to promote development that preserves natural resources and hydrologic functions, maintains water quality, and minimizes site disturbance. For example, rather than conveying stormwater to large, costly ponds, low impact development encourages small, cost-effective landscape features on each lot.

Other examples of Smart Growth include developments that employ concepts like eco-urbanism and clustering. Eco-urbanism is a blending of human habitat into the natural ecosystem. It accommodates growth while minimizing land disturbance and maintaining the natural beauty of the land. Eco-urban communities feature lakes, wetlands, tree conservation areas, and stream valley parks.

A number of developers are experimenting with cluster designs that accommodate wildlife habitat, forests, and agriculture. Cluster development can also produce significant benefits in stormwater management (see *News-Notes* #43).

To facilitate the sharing of such ideas and build partnerships, EPA developed the Smart Growth Network, a coalition of developers, lenders, building materials manufacturers, local governments, and smart growth advocates. Coordinated by the EPA's Urban and Economic

Development Division, the network seeks to create neighborhoods, communities, and regions across the United States using smart growth concepts.

The Smart Growth Conference signaled a new and promising era for individuals, neighborhoods, businesses. Lessons learned will undoubtedly lead to successful examples of smart growth practiced locally, regionally, and nationally.

[For more information, contact Jessica Cogan (4504F), U.S. EPA, 401 M Street, SW, Washington, DC 20460. Phone: (202) 260-7154.]

EPA Proposes Extending the NPDES Storm Water Permit Program to Smaller Municipalities and Construction Sites

By John A. Kosco, P.E., EPA Office of Water

On January 9, 1998, the Federal Register published U.S. EPA's "Proposed Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges," commonly referred to as the NPDES Storm Water Phase II proposed rule. The proposal, which fulfills a commitment made by the President's Clean Water Action Plan (see page 1), designates two classes of facilities for automatic coverage on a nationwide basis under the NPDES program:

- Small municipal separate storm sewer systems (pollutants include sediment, floatables, oil and grease, as well as other pollutants from illicit discharges) located in urbanized areas. This class covers about 3,500 municipalities.
- Construction activities (pollutants include sediments and erosion from these sites) that disturb one or more, but less than five, acres of land. About 110,000 sites per year will be included in this program.

Both classes will need to apply for NPDES storm water permits in 2002. EPA anticipates that most permittees would be covered under general permits.

EPA is also proposing to conditionally exclude certain facilities from the NPDES storm water program, specifically Phase I facilities that do not expose materials such as industrial products, processes, or raw materials, to storm water.

EPA developed the proposal with extensive stakeholder involvement, including input from members of a subcommittee under the Urban Wet Weather Federal Advisory Committee; state, tribal, municipal, industrial, and environmental representatives; and small entities under the Small Business Regulatory Enforcement Fairness Act. EPA also convened a Small Business Advocacy Review Panel to evaluate and minimize the potential impact of the proposed rule on small entities.

EPA will accept comments on this proposed rule until April 9, 1998, and will issue a final regulation by March 1, 1999. Copies of the proposed rule can be obtained from the January 9, 1998 Federal Register, EPA's web site at <http://www.epa.gov/OWM/sw2.htm>. Limited hard copies are available by calling the Water Resource Center, (202) 260-7786.

[For more information, e-mail: <sw2@epamail.epa.gov> or phone (202) 260-5816.]

Audubon Cooperative Sanctuary Golf Courses Good for More Than Just "Birdies"

The image of golf courses as artificial landscapes devoid of wildlife save for the occasional "birdie" is changing. Largely responsible for the evolving perception is the six-year-old partnership between the United States Golf Association and Audubon International. Together they administer a cooperative program that promotes ecologically sound land management and the conservation of natural resources and also yields substantial water quality benefits.

Over 109 fairways in the United States and overseas are certified as Audubon Cooperative Sanctuaries. Another 500 are working toward certification. The requirements are rigorous. It takes between one and three years to earn certification. Participants must fulfill environmental planning, wildlife and habitat management, public involvement, integrated pest management, water conservation, and water quality management requirements. To enroll, golf course

superintendents submit a written application that includes details on the size of the course, existing wildlife habitat, buildings on the property, water use statistics, waste disposal methods, and course management. The applicant also supplies a map and photos of the course. With the background materials in hand, Audubon International fashions a report suggesting BMP strategies that fit the needs of each course.

The golf course then develops an environmental plan and an advisory committee. The committee is composed of representatives of environmental groups, school board staff, small business owners, and elected officials. It reviews and approves the proposed environmental plan, which is sent to Audubon International for its approval.

Fox Hills

Fox Hills Golf and Conference Center in Plymouth, Michigan, completed this process in 1995. A public course built in the 1920s, Fox Hills has undergone extensive physical changes. It now boasts wildlife management areas, wetland buffers, 20 acres of prairie grass, and nesting boxes. Management points proudly to a family of pheasants living on the course. The program has helped to improve water quality in the area surrounding the Fox Hills course. According to Eric Nemur, course superintendent, nitrate levels in a stream running through the course have decreased as a result of buffer strips installed under the Audubon Cooperative Sanctuary Program.

Nemur considers the program registration fees (\$100 a year) and BMP maintenance a cost-effective tradeoff for the reduced cost of maintaining the course itself. The areas set aside as buffers and wildlife habitat require less input than they did when the course was managed traditionally with intensive mowing, seeding, pesticides, and fertilizer. In fact, because implementing some of the water quality protection measures are already called for by state and local mandates, the costs for maintaining the Audubon program requirements are small.

Robert Trent Jones Golf Club

The Robert Trent Jones Golf Club, a private course in Manassas, Virginia, hugs the banks of Lake Manassas. The 850-acre lake is, in fact, a big reason the golf course chose to participate in the Audubon Cooperative Sanctuary Program. It provides drinking water for the city of Manassas and other portions of Prince William County. The first Virginia course to be certified (in 1994), its grounds keepers are, of necessity, knowledgeable about nonpoint source runoff and water quality protection techniques. They choose grasses with low nitrogen requirements and apply pesticides only on an as-needed basis. Assistant Superintendent Marlan Ewing, along with other staff, conducts water sampling and pest scouting trips routinely.

Nitrate levels in the lake have actually decreased since the course was built on idled farmland. Ewing believes that the decrease results from the strict water management practices used at the course, which keeps 96 percent of the water it uses on site. And says, Harold Post, research associate at the Occoquan Watershed Monitoring Laboratory (part of Virginia Tech's Civil Engineering School), "the golf course does a very good job of controlling what they put down in the way of pesticides and fertilizer." The lab monitors the inlet and outlet at a wetpond on the course after each storm event for nitrogen, phosphorus, pesticides, fertilizers, and metals. "The golf course is probably a better land use for the reservoir than one more residential in nature," says Post.

According to Ewing, the only negative effect the course has suffered as a result of the program has been a periodic overabundance of wildlife. "It is definitely a challenge to find the right balance of geese, deer, and other wildlife so that they are present," says Ewing, "but not in such high numbers that they are competing for food and habitat." So far, golfers there have been privileged to observe 117 different bird species, foxes, bats, and other wildlife.

"Green" Courses Provide Greater Challenge to Golfers

Many courses incorporating less intensively managed areas have narrower, more difficult fairways. Does the emphasis on the environment detract from the game? No, says Nemur, who sees the special wildlife management areas and natural settings at Fox Hills as adding to the sport's challenge. So far, the center has received only positive feedback from golfers who frequent the course. However, Nemur feels the public has a long way to go before golfers start

Maryland Golf Course Is a Preferred Land Use for Cleaner Ground Water

Located within a Chesapeake Bay Critical Area in Queenstown, Maryland, the Queenstown Harbor Golf Links groundwater monitoring program has data documenting major nitrogen loading reductions. According to Steve Roy, a water quality specialist who studied the site, the managed turf reflects lower nitrogen concentrations than would be expected if the site were in agriculture or residential development.

Queenstown Harbor Golf Links requires extensive environmental review and planning because of its proximity to the Chesapeake Bay. Prior to its approval for construction and operation, the course's management had to develop an Integrated Pest Management Plan and a nutrient management plan and install ground water monitoring wells. Now, monitoring wells located on tees, greens, fairways, and roughs yield data about ground water moving onto, beneath, and off the site.

Prior to construction, when the land was in active corn, soybean, and wheat production, nitrate-nitrogen concentrations in the ground water ranged from 19 milligrams per liter (mg/L) beneath cropped areas to 0.02 mg/L in undisturbed background areas, averaging 5.34

mg/L in 1990. In 1997, seven years after the course was built, the average nitrate-nitrogen concentrations for all wells were 2.04 mg/L, an overall reduction of 62 percent. The improvement was better than that predicted by a model Roy developed in 1990, which indicated that nitrogen concentrations in the ground water beneath the established golf course would probably range between 3.95 and 5.1 mg/L).

When the course decided to expand in 1994, in an area under active corn production, nitrate-nitrogen concentrations prior to the construction of the new course were as high as 18.3 mg/L. Recent sampling in the fall of 1997 in this well showed a concentration of 1.7 mg/L of nitrate-nitrogen, representing a 91 percent decrease. The decrease is especially noteworthy because the sample well is located on a tee, the most intensively managed location on a golf course.

Superintendent Bill Shirk is pleased with the environmental success of the course's design, construction, and operation. He believes that it demonstrates that a managed turf environment can actually result in improved ground water quality compared to other land uses.

[For more information, contact Bill Shirk, Superintendent, Queenstown Harbor Golf Links, 310 Links Lane, Queenstown, MD 21658. Phone: (410) 827-7518. Or contact Steve Roy, Tetra Tech, 10306 Eaton Place, Suite 340, Fairfax, VA 22030. Phone: (703) 385-6000.]

picking their favorite courses on the basis of environmental practices. "The average golfer is still looking for greens and fairways that look like the ones on TV," says Nemur. He hopes that more Audubon courses will promote their involvement and raise awareness about the benefits of environmentally sound golf course management. John Craig, an avid golfer who is also a water resources specialist for an environmental consulting firm in Northern Virginia, has visited several of the Audubon courses and is impressed with the program. "These courses are able to provide many benefits to the public, including water quality protection, crucially needed wildlife habitat, and the more obvious recreational benefits," he says.

[For more information, contact Mary Colleen Liburdi, Communications Director, Audubon International, Inc., 46 Rarick Road, Selkirk, NY 12158. Phone: (518) 767-9051.]

Technical and Research Notes

From City Trash to Farm Treasure

The New York Times may contain "all the news that's fit to print," but when Jim Edwards of the USDA Agricultural Research Service in Auburn, Alabama, mentions newspaper content, he's talking about carbon levels and composting. For nearly seven years, Edwards has been experimenting with different blends of newsprint, telephone books, yard waste, and poultry manure to find the magic combination of carbon and nitrogen that will raise crop yields and lower costs while cutting nonpoint source pollution.

The resulting compost or recycled product (which is formed into pellets three-eighths to four inches in length) can be used, ultimately, to add nutrients and organic matter to the soil, hold moisture, and guard against weeds. But Edwards, a soil scientist, envisions benefits far beyond the edge of the field. He believes that the paper pellets that he has developed with Tascon, a Houston recycling firm, can ease pressure on municipal landfills and help solve water quality problems.

The pellets' ingredients are plentiful. Each American throws away about 1.6 pounds of paper a day, making up about 40 percent of the solid waste stream sent to ever-shrinking landfills. And, each year (using 1996 figures), roughly 7.6 billion U.S. broiler chickens generate about 15.2 billion tons of nutrient-laden litter that poses a significant nonpoint source pollution risk.

Used in place of sawdust and rice hulls as livestock and poultry bedding, recycled paper pellets immobilize the phosphorus and nitrogen in the manure by converting these nutrients into nonwater-soluble forms. The pellets then enter a third "life-phase" as a fertilizer and soil amendment. Although the insoluble nutrients they contain pose less risk to streams and lakes, they are still available to plants.

A Promising Alternative

Considering the many tons of phosphorus and nitrogen that may wash off farms each year to contaminate surface water, paper litter could be a viable answer, says Brad Lamb, EPA Region 6's Nonpoint Source Coordinator. He believes that the pellets "have the potential to be another tool to help reduce polluted runoff from agricultural operations." EPA Region 6 has supported proposed projects using the pellets in central and western Texas. However, Lamb feels that more research on costs, effectiveness, and potential adverse effects is needed before the pellets gain widespread acceptance.

The product is not without its downside. While most modern inks are biodegradable, some older inks contain lead and other heavy metals such as chromium, copper, and zinc that can leach into the environment. Edwards and his staff have been able to reduce risks by mixing older printed material with other wastepaper and cardboard. There are also concerns about aluminum in newsprint, which has been shown to induce nutrient disorders in plants.

Edwards, however, is enthusiastic about his work with the pellets. He is looking forward to seeing demonstration projects get underway soon. Wind tunnel studies conducted at the USDA Agricultural Research Station in Big Spring, Texas, showed that the pellets reduced wind erosion by 95 percent. And the pellets are capable of absorbing four to five times their weight in moisture, making them a good winter alternative for reducing runoff and maintaining soil moisture, especially in dry regions where winter cover crops rob the soil of water.

The pellets may have other benefits as well. Some studies have suggested that paper pellets can suppress plant pathogens, especially fungi, and that the high carbon content in the paper feeds beneficial bacteria that help plants ward off disease. Used as a mulch, the pellets fight weeds by matting together and forming a physical barrier on the soil surface. In experiments conducted by the Department of Horticulture at Auburn University, paper pellets controlled weed growth as well as or better than traditional chemical herbicides.

Additional research into the effects of land application of organic materials on soil nutrient dynamics is needed before paper pellets can receive an unqualified thumbs up. But if obstacles to using the paper pellets can be overcome, they may soon be making water quality headlines.

[For more information, contact Jim Edwards, Agricultural Research Service, National Soil Dynamics Laboratory, Box 3439, Auburn, AL 36831-3439. Phone: (334) 844-3979; e-mail: <edward@acesag.auburn.edu>. Or contact Jim Adamoli, Tascon, Inc., P.O. Box 41846, Houston, TX 77241. Phone: (713) 937-0900; e-mail: <jadamoli@aol.com>.]

Nontoxic Paint Makes Boat Hull Maintenance Safer for Aquatic Life

Each year, the Navy, Coast Guard, commercial enterprises, and recreational boaters spend millions of dollars combating the small creatures that find ship hulls an ideal place to attach themselves. Traditional "antifouling" paints used to discourage the organisms pose a threat to the health of aquatic ecosystems. But now several new, nontoxic treatments may reduce pollution from boats and marinas, while at the same time reducing ship maintenance costs.

Though the individual "foulers" (algae, barnacles, and tube worms) are usually less than two inches long, accumulations induce friction that can increase a ship's fuel consumption by as much as 20 percent and keep it from attaining cruising speed. Traditional antifouling paints have a tributyltin (TBT) or copper base. They are very effective but also highly toxic to other aquatic life. The toxicity of such paints and concerns about their disposal and the exposure of

shipyard workers and recreational boaters to them has led to federal restrictions on their use. The International Maritime Organization is, in fact, considering a global phaseout of tributyltin.

Silicone Paints — An Alternative with Less Risk, Lower Costs

The U.S. Navy, working closely with the Silicones Division of General Electric, has developed and patented a silicone-based coating system that provides a nonstick, easy-to-clean surface from which organisms can be easily removed with a water sprayer or soft brush. In fact, if the vessel reaches a high enough cruising speed, the friction caused by the water can literally pull the foulers off the hull.

Repainting a boat hull with traditional antifouling paints may cost \$500,000 or more for a large ship. Applying the new nontoxic coating involves several steps and costs about \$1 to \$1.50 more per square foot. But when the reduced risk to aquatic ecosystems and the cost of removing and disposing of toxic paints is factored in, the new paints may prove a bargain. For example, when using toxic materials, dry docks must contain all the water used so that copper and other toxics do not wash into the harbor. However, says Joann Jones-Meehan of the Naval Research Laboratory in Washington, D.C., "disposal of the silicone coating, a nonhazardous waste product, requires no special containment area and no additional costs."

Because they reduce fouling by physical rather than chemical means, the newer paints are subject to fewer federal and state restrictions. In fact, notes Jones-Meehan, the coatings are "ideal candidates for endorsement under various nonpoint source pollution control programs." The easy-release paints are not soluble in water, and their molecules are too large to pass through the membranes of living organisms, making the paint safe for aquatic life.

Future Directions

Several demonstration projects have been successful. In one Bay City, Michigan, test, a coating was applied to a cooling water intake tunnel of a power plant. After two years, the coating, which remained intact, had completely prevented the accumulation of zebra mussels on the walls of the tunnel. An untreated area suffered a heavy coating of mussels. Further, the plant now cleans its intake tunnels every two years rather than every year, as they had previously. Plant officials say the coating saves \$10,000 every two years in maintenance costs and has contributed to increased condenser efficiency.

Current investigations are focusing on the durability of the silicone paint. Because the coating is elastic, it is more susceptible to shearing, tearing, and abrasion than are other paints. But some newer brands appear to be more tear-resistant. GE is also working on a version of the coating that will control *Crepidula* snails, which are a fouling problem for some power plants on the East Coast and in Europe. In another project, GE is working with the Fish and Wildlife Service to develop a suitable nontoxic coating for use on fishing nets, which are often weighed down by marine foulants and abandoned in the ocean.

[For more information, contact Joanne Jones-Meehan, Naval Research Lab/Code 6115, 4555 Overlook Avenue, SW, Washington, DC 20375-5320. Phone: (202) 404-6361; e-mail: <jonesmee@ccf.nrl.navy.mil>.]

Education News

Standard Educational Principles Apply to Watershed Outreach

Adapted from *Keeping Current* 5(5). June/July 1997.

Educators have long recognized the basic components of successful outreach, such as specific educational objectives, target audiences, strategies for reaching different audiences, and needs assessments. Yet water quality projects don't always employ these well-known principles, according to a study by the University of Wisconsin Extension's Environmental Resource Center.

Educators Robin Shepard and Susan Smetzer Anderson, analyzed 14 plans for outreach projects in Wisconsin's priority watershed program and discovered that only a fraction of the plans addressed the four standard principles.

Setting Education Objectives

Only four of the 14 plans stressed behavior-oriented objectives such as increasing the percentage of farmers using soil testing. "General objectives," Shepard and Anderson noted, "may be appropriate where people are not aware of water quality problems [But] . . . overly general messages are not likely to capture the attention of people who may be dubious about a topic's personal relevance."

Knowing the Audience

Targeting the audience correctly involves two steps: identifying the general populations in a watershed, such as farmers and urban residents, is fundamental; but a second important step is defining subgroups within the populations who impact water quality in different ways. Each subgroup requires its own distinct message and communication channels. Shepard and Anderson found that only three of the plans in their study took the crucial second step. More precise identification, they said, would enable "educators to craft more targeted programs . . . [making] more efficient use of limited financial resources."

Communication Strategies

A ruling communications principle is that multiple communication strategies and channels are needed to inform the maximum number of people. Messages should not only be broadcast widely, but the message should be tailored to the needs of specific audiences. But again, only one of the Wisconsin plans explained why a specific strategy was chosen.

Needs and Evaluations

Needs assessments help define action-oriented objectives and identify target audiences. Evaluations before, during, and after an educational effort help educators assess the value of communication strategies and correct it if necessary. In 10 of the 14 Wisconsin plans, needs assessments were discussed. Four plans described how the results would be used in program planning and used an assessment to identify target audiences. Three projects intended to use the assessments to gauge how audience perceptions and behaviors changed over time. Shepard and Anderson advise educators to consider using more surveys and discussion forums to quantify the specific needs of people living in the project watershed.

While watershed educators must certainly be familiar with water quality issues, knowing the standard principles for developing educational programs is also necessary to help them develop successful outreach programs.

[For more information, contact Robin Shepard, University of Wisconsin Extension, Environmental Resources Center, Room 216, Agriculture Hall, 1450 Linden Drive, Madison, WI 53706. Phone: (608) 262-1916.]

Education and Outreach in Action Column

■ **From Brownfields to Green Fields.** Elkhart, Indiana, is proud of having turned a former brownfield into an environmental showcase. Where once a Superfund site, antiquated landfills, illegal dumps, and sludge farms threatened water quality; ground water monitoring stations, an environmental education center, recycling depots, and a nature preserve are now thriving. The city capped its old dump, then built the Elkhart Environmental Center on the site, with four created wetlands, an amphitheater (built by local Boy Scouts), canoe launch, and butterfly garden.

The new Center's education programs have reached more than 25,000 students. A curbside recycling program has diverted more than 15 million pounds of trash from city landfills, and Elkhart won an AmeriCorps National Service Program Award for its community service program — for building a nature preserve on the site of a former city sludge farm. In 1995, Elkhart was the state's first Groundwater Guardian Community recognized for its public education program. Elkhart's ground water supply, which had been contaminated with an industrial chemical, was cleaned up using a barrier system that diverted polluted water away from the city's supply pumps. Now, a wellhead protection program monitors water entering the wellfield pumping stations.

[For more information, contact Eric Horvath, City of Elkhart, 1201 South Nappanee Street, Elkhart, IN 46516. Phone: (219) 293-2572.]

■ **Boy Scouts Monitor for Badges and the Environment** Boy Scouts near Houston, Texas, are monitoring the water quality of Grand Lake and earning their Scout badges in the process. The area surrounding Grand Lake is developing rapidly as the city expands. Erosion from construction has increased siltation in the lake, and stormwater is adding other pollutants. Several scouts who are now certified Texas Watch Monitors are teaching others how to collect samples. Scout leaders hope the program will establish a solid core of monitors and trainers to carry the program into the future.

[For more information about the scouting program, contact Glenn Buckley, Chairman, Conservation Committee, Sam Houston Area Council, Boy Scouts of America, 94 Windsail Place, The Woodlands, Texas 77381. Phone: (281) 423-5585; fax: 281-423-7719. For information about Texas Watch, visit <www.tnrcc.state.tx.us/txwatch> or contact Greg Bryant, TNRCC, MC-150, PO Box 13087, Austin, Texas 78711-3087. Phone: (512) 239-6941.]

■ **From Awareness to Action in California** Two programs under the umbrella of the California 4-H Youth Development Program help students learn how everyday activities impact their world. Science Experiences and Resources for Informal Education Settings (SERIES), for children 8-12, and Youth Experiences in Sciences (YES), for children ages 5-8, are led by teenage volunteers under the guidance of volunteer adult coaches. The children (with the help of their teen leaders) undertake community service projects related to the curriculum unit currently being presented (e.g., recycling, water pollution, pest management). The curricula were developed by the California 4-H Youth Development Program, the Graduate School of Education at the University of California-Berkeley and the Lawrence Hall of Science. They promote critical thinking, evidence gathering, decisionmaking skills, and application to real-life situations.

[For more information, contact SERIES/YES Projects, Human and Community Development, University of California, Davis, CA 95616-8523. Phone (916) 752-8824.]

■ **46th Annual National Land and Range Judging Contest** More than 900 teens and adults from 32 states competed in 4-H, FFA, and adult divisions for land judging, range judging, and homesite evaluation in the National Land and Range Judging Contest, held in Oklahoma City, Oklahoma. The event is sponsored by the Oklahoma Association of Conservation Districts with assistance from Oklahoma State University, the Farm Bureau, and other organizations. Contestants rate the soil and land characteristics for a variety of uses. This valuable skill can lead to careers in farming, natural resource conservation, home building, landscaping, and construction.

[A 15-minute video showing the highlights from this year's national contest is available for \$20 from Jim Stiegler, Oklahoma State University, Agronomy, Ag Hall, Stillwater, OK 74078. Phone: (405) 744-6421.]

■ **High School Restoration Class Offers Skills, Hope** Students at Shorecrest High School in Seattle, Washington, can satisfy vocational education requirements by taking a class on environmental restoration. Environmental professionals from the Student Conservation Association, The Nature Conservancy, and the U.S. Forest Service offer visiting lectures. Students read from a variety of publications, including *On-Site Restoration Methods for Mountainous Regions of the West*, authored by their teacher, Russell Hanbey. They grow native plants in the school greenhouse — for donation to the community — and they conduct community restoration projects. Recently, students helped restore abandoned mountain logging roads that were compromising the health of local streams and fisheries.

The course follows a concept developed by the Society for Ecological Restoration's New Academy Initiative that describes "restoration and education — healing and learning — as part and parcel of the same process." Each student is required to complete a semester-long project, participate in "hands-on" activities at school, and volunteer for three hours of after-school restoration-related community projects.

[For more information, contact Russell Hanbey, Shorecrest High School, 15343 25th Avenue NE, Seattle, WA 98115. Phone: (206) 361-4286; fax: (206) 361-4284.]

Reviews and Announcements

Waters, Rivers and Creeks

By Luna B. Leopold, Sausalito, CA: University Science Books, 1997. \$30 hardcover.

Reviewed by Rachel Reeder, Terrene Institute

Waters, Rivers and Creeks is an expanded and reorganized version of a long out-of-print book, called *Water — A Primer*. Though it takes a systems approach, the book focuses on the physical aspects of rivers and other waters, and it is a potentially significant book for policymakers, despite its brevity and straightforward adherence to natural processes as the arbiter of reason.

Waters, Rivers and Creeks is enlightening and practical, not least because Luna Leopold — a geologist — describes an arcane science in elementary terms, but because he writes for the layperson, and that makes all the difference. *Waters, Rivers and Creeks* is a flow of recognitions, a way to see — and own — the knowledge we already have about water. And in the process, the former chief hydrologist of the U.S. Geological Survey, and professor emeritus of the Department of Geology and Geophysics at the University of California, Berkeley, gives us something better than explanation.

A glass of iced tea, a dishpan half-filled with sand, sieves made of fine mesh, a candle wick, newspaper reports about wells going dry, and reminders of what it's like to dig in a garden — observations so commonplace that they have been forgotten — are the stuff that Leopold uses to make the mystery of water and water's relationship to climate, soil, and plants so utterly clear.

Anyone who has found it difficult to connect the piezometric surface and cone of depression (for example) to a discussion of water rights and quality; or to understand how little the extraordinary discharges of flood events affect the appearance of the river channel (which, after all, is not formed by major catastrophes but by modest and frequent small-storm flows) will like this book.

It is not entirely easy; it bids us cast our eye over thousands of years and numerous complex interactions of climate, soil, and water that shape the channel, the floodplain and terraces that constitute the river system. But having done so, it makes the explanation of fluctuating supplies, water budgets, and municipal water supply systems a piece of cake.

The length of the conclusion, barely four paragraphs, is, like the length of the book as a whole, inversely related to its value. "Hydrological principles," Leopold asserts, "are not controversial. The more that is known about hydrology, the easier it is to judge alternative proposals and to compare their benefits and cost."

How refreshing it would be if those responsible for public information would begin their programs based on this book! Leopold's reverence for rivers never obscures his goal or his conviction that "sound decisions require an informed citizenry."

The Ecology of Hope

By Ted Bernard and Jora Young, East Haven, Connecticut: New Society Publishers, 1997. \$16.95 plus \$3 shipping and handling.

Reviewed by Rachel Reeder, Terrene Institute

Subtitled, "Communities Collaborate for Sustainability," this book is a collection of stories about sustainable development and the revitalization of local communities. It shows how different factions and interest groups in diverse settings emerge in critical times to develop consensual and holistic ways to salvage threatened natural and cultural resources.

Resource managers wanting technical details about nonpoint source controls or planners looking for measurable results may be frustrated by the book. On the other hand, its authors' brief sojourns in eight U.S. communities — from Monhegan Island, Maine, to the Mattole River watershed at the westernmost tip of California, and from Menominee, Wisconsin, to the borderlands of Arizona and New Mexico and points between — are a rich vein of information. The details, now that we know the source of the information, can be mined from shorter, more technical case studies.

And what information is here will delight citizens, policymakers, community organizers, and regulators. *The Ecology of Hope* offers ample, if anecdotal, proof that the quintessentially American commitment to living both for and off the land is as strong as ever and still the basis for enduring partnerships based on cooperation and the embrace of multiple objectives.

Locally led partnerships are part of a "third wave" in the American conservation movement. This wave, the authors tell us, is more grounded, biocentric, and appreciative of the link between people and nature than previous stages of the movement. Managers in this era are people whose vision of how problems can be resolved includes "not ruining for others what we ourselves enjoy." Bernard and Young's ethic of sustainability is characteristically simple: "the effort to live in such a way that the needs of future generations can still be served."

The communities profiled share a reliance on consensus and a belief in a mix of voluntary and enforcement measures as tools for resource management. Each has initiated a dialogue between "homesteaders" (or "been heres" as the natives are called on Virginia's eastern shore), and new residents (or "come heres") to preserve local resources and values amid changes that threaten their communities.

The way to sustainability for these communities begins with the recovery or revitalization of traditional practices (e.g., the logging directives that 19th-century Menominee chiefs gave to their descendants.) It then refines these practices with new technologies (e.g., the Menominees' commitment to scientific forestry and their realization that a healthy forest stand also requires attention to "all the other attributes of the forest"). This conjunction of tradition and science helps these communities correct past mistakes and frees them to find a better way. For example, the Menominees have learned that some clear cutting may be necessary to reestablish early successional forest types (e.g., aspen and white pine).

NPS Issues Demand Widespread Changes

The book also speaks eloquently of getting down to "the root issues" that make nonpoint source pollution prevention so difficult. Whatever problem in the "commons" forges the original coalition, extending the issue to nonpoint source pollution is "bound to reinstate turf issues or demand the kind of widespread changes in human behavior that are difficult to accomplish." Seth Zuckerman, a homesteader living in and working for the Mattole River watershed, puts it this way: "As soon as you start talking about forests and sediment, it gets personal. It's coming off everybody's land, everybody's roads, everybody's building sites. These are matters of people's everyday lives and livelihoods. Consensus disappears."

The Mattole River watershed began its partnership experiment to help prevent the disappearance of king salmon, and the "salmon group" then helped launch a council that now works to restore and sustain "the healthy functioning of all the watershed's natural systems." The salmon initiative was approved by nearly all residents in the watershed, but as Dan Weaver concedes, "Once we got away from the salmon, we were on thin ice."

The Mattole experience illustrates the promise and the compromise involved in each of these coalitions. The return of the salmon was slower and less successful than the community had hoped, and the "salmon group" had to overcome opposition from within and without. The California Department of Fish and Game originally opposed their work, not sure how to react to having "nonlicensed civilians trapping, carrying, and incubating wild fish." Later opposition from within the watershed led to some "fairly divisive" lawsuits. However, now the salmon appear to be coping, and the councilors agree with one another: "With each meeting [of the council] trust builds. We need to go on."

This struggle continues to be played out in different ways in each of the communities Bernard and Young visited. It is acknowledged but not expunged, and definitely not used to temper the book's original thesis. The chapter on the Mattole, for example, concludes on this optimistic note:

Our time in the Mattole convinces us that this is about a different kind of resource management based neither on political constructs nor resource warfare but on the way nature works. It centers around a unit of inordinate natural significance, the watershed, and on mutual concern for the health not only of this watershed but also of the human economy. This kind of resource management is home-grown and mindful of the need to sustainably use natural

resources, rangelands and timber specifically. It welcomes partners, particularly folk who for generations have made their living from the land and water, and it strives to make decisions based on sound scientific information and local knowledge of place. It respects the web of living things and perceives that human well-being depends on the well-being of ecological processes.

While it is possible to approve this thesis, it is also possible to question whether it is completely honest as stated. Does it not also seem, based solely on Bernard and Young's own report, that these coalitions are successful at least in part because the partners have added a degree of political savvy to their notion of "how nature works"?

For example, The Nature Conservancy and several local communities (most notably, on Virginia's eastern coast and in the borderlands between Arizona and New Mexico) have each expanded their vision and accomplished more than they set out to do by overcoming original antipathies and mutual suspicion. The Nature Conservancy had to learn that preserving the land by buying up large parcels is neither sufficient nor always an acceptable way to help local communities; and the communities had to learn that the Conservancy had not come in solely to usurp local authority.

In short, the willingness to yield a "right" here or there to gain a more lasting privilege in its place, and the dawning acceptance that some degree of regulation is needed, may be a larger part of Bernard and Young's new stories than they have perhaps realized.

The authors admit that they began their search for these stories because the old ones "no longer work," and "a good story has the power to save us." Those of a less literary, not to say less romantic, temperament may find such references less productive than reliance on conservation tillage, zoning ordinances, easements, or other concrete measures to preserve resources. Few, however, will deny that we need a collection of models to help us find positive, consensus-based ways of using natural resources wisely, that is, without simultaneously "profoundly interrupting [the] natural cycles of renewal."

Taken one by one, each chapter in the collection is readable and instructive, and each one shows the human face of environmental planning. For that, we can be extremely grateful; there is little enough of that in the literature.

Conservation Design for Stormwater Management

A joint effort between the Delaware Department of Natural Resources and Environmental Control and the Environmental Management Center of the Brandywine Conservancy produced this manual for prospective developers and municipal planning agencies. Although designed for use in Delaware, *Conservation Design for Stormwater Management* has useful applications for other states.

The conservation design approach makes maximum use of natural features to more closely mimic the predevelopment hydrology of a site. Nonstructural BMPs are used whenever possible, reducing or eliminating more expensive structural management controls. Swales between lots and along roadways aid infiltration and carry overflow to natural wetlands or discharge points. In one design, divided roads offer infiltration areas between the lanes. Open space can then be maximized for stormwater management use.

Starting with a basic explanation of the water budget, this 225-plus page publication describes nonstructural conservation techniques resources and the limitations and resources of various sites, ending with a chapter that contains four conservation design case studies of different sites.

Even though the size of lots are reduced under some of the scenarios, plans call for the same size houses. In other situations, lot sizes remain the same, but houses are constructed to leave more natural area on each lot. Retained natural areas enhance esthetics and provide recreation opportunities. They also reduce the need for more expensive structural stormwater management controls.

[For more information or to order a copy of the manual (\$25 plus shipping and handling), contact Frank Piorko, Delaware Department of Natural Resources and Environmental Control, 89 Kings Highway, Box 1401, Dover, DE 19903. Phone: (302) 739-4411.]

Other Resources

- **Internet.** *Enforceable State Laws and Regulations to Control NPS.* The Environmental Law Institute recently posted a comprehensive study that examines state laws to identify and analyze enforceable mechanisms for the control of NPS. To access this report, go to <http://www.epa.gov/OWOW/NPS/elistudy>.
- **Catalog.** *1997 International Erosion Control Association Resource Catalog.* This catalog contains publications on everything from erosion control plans to conference proceedings. For a free copy, contact IECA at (800) 455-4322; fax: (970) 879-8563; e-mail: 502O@ieca.org; web: www.ieca.org.
- **Manuals.** *You and Your Land, A Homeowner's Guide for the Potomac River Watershed.* Provides practical information that homeowners can easily understand to help them help keep nutrients from reaching the Potomac River. To receive a copy, contact the Northern Virginia Soil and Water Conservation District at (703) 324-1423. The cost of the guide is \$5, which includes postage.
A Citizen's Handbook to Address Contaminated Coal Mine Drainage. Intended to familiarize citizens with coal mine drainage from abandoned mines and to provide the tools needed to help clean up the waters of Appalachia. It provides an overview of the step-by-step process of contaminated coal mine drainage clean up and the role that citizens and grassroots can play in that process. To receive a copy, contact the Public Environmental Education Center of the U.S. Environmental Protection Agency, Region 3 at (215) 566-5121.
Aquatic Plant Management in Lakes and Reservoirs. Part of a continuing series of technical supplements for the *Lake and Reservoir Restoration Guidance Manual* (Olem and Flock, 1990). The first two technical supplements were *Monitoring Lake and Reservoir Restoration* and *Fish and Fisheries Management in Lakes and Reservoirs*. Copies are \$20, or \$15 for members of the North American Lake Management Society. Contact North American Lake Management Society, P.O. Box 5443, Madison, WI 53705-5443 or Aquatic Plant Management Society, P.O. Box 1477, Lehigh, FL 33970; web: <http://aquatl.ifas.ufl.edu/database.html>.
- **Video.** *Adirondack Waters: Can We Keep Them Clean?* Targets residents and municipal officials with an introduction to watershed planning and water quality protection. Produced by the Resident's Committee to Protect the Adirondacks, the 30-minute video features the Adirondack Mountains of New York. The video costs \$6.00 (including postage) and can be obtained by contacting the Resident's Committee to Protect the Adirondacks, P.O. Box 27, North Creek, NY 12853-0027.
- **Report.** *National Onsite Wastewater Treatment: A National Small Flows Clearinghouse Summary of Onsite Systems in the United States, 1993.* A 414-page document describing commonly cited problems with onsite systems, local agencies working with onsite systems, permit and system costs, and onsite system maintenance responsibility from more than 1,500 local health departments and agencies in 46 states. The report costs \$17.50, plus shipping and handling. Request item #WWBKGN89. Order from NSF, phone: (800) 624-8301; fax: (304) 293-3161; e-mail: nsfc_orders@estd.wvu.edu.

NPS Electronic Information Exchange

The NPS Information Exchange has evolved from a modem-based electronic bulletin board to a system of Internet resources. Documents, including News-Notes issues 1-49, are now located on the NPS Information Exchange World Wide Web site:
<<http://www.epa.gov/owow/wtr1/info/newsnotes/index.html>>

NPSINFO is the Information Exchange's e-mail discussion group.

To subscribe to this group, send an e-mail message to listserver@unixmail.rtpnc.epa.gov.

Include the following text in your message: `subscribe NPSINFO yourfirstname yourlastname`.

After you subscribe, you will receive a welcome message explaining the discussion list and how to post messages to it.

Reflections

Haiku by the Slough

Web

A web of dead plants
The spider weaving on through
The tangle of life

By Leslie Modrich

Kickapoo, Wisconsin, high school teacher Frank Accomando requires students in his environmental sciences course to write haiku poetry. The haiku poem, a Japanese poetry form, embodies lyrical, sublime, concise expression. Nature is often a subject of haiku poetry.

Harnessing poetry's power to heighten awareness was Accomando's aim when, in February 1997, he asked his students to don boots and snowshoes and follow him across the highway to the frozen Kickapoo River. There they composed poetry that was published as a small book, *Haiku by the Slough*. "Web" was one of the poems included in the book.

"The goal of the class," said Accomando, "was to learn about the Kickapoo River and its tributaries, and how to monitor their health. But before we did this, I felt we had to figure out why we were doing this in the first place. So, we looked at the writings of Thoreau, Whitman, Emerson, and others and discussed how their beliefs applied to our situation."

Then the students got down to business. After conducting an exhaustive comparative analysis of several different protocols for monitoring the chemical, biological, and physical aspects of a river, the students split into three groups to study the Kickapoo and its two tributaries. While this work was going on, guest speakers visited the class to share their knowledge about the valley's land-use history, the relationship between current land uses and water quality, the valley's hydrogeologic system and other topics. The class wound up with a canoe trip down the river.

If the next generation of scientists are also poets, and tomorrow's poets are well versed in science, surely there is hope that these stewards will manage our waters with both wisdom and knowledge.

[For more information, contact Tina Hirsch, Coordinator, Kickapoo Valley Community Stewardship Project, (608) 637-8095.]

Datebook

DATEBOOK is prepared with the cooperation of our readers. If you would like a meeting or event placed in the DATEBOOK, contact the NPS NEWS-NOTES editors. Notices should be in our hands at least two months in advance to ensure timely publication. This listing is available online at www.epa.gov/OWOW/NPS/events.html. A more complete listing is available on the NPS Information Exchange World Wide Web Site (see the NPS Information Exchange box in this issue for directions on how to get on).

Meetings and Events

1998

May

17-22 *Flood Mitigation Technology: Times Are Changing*, Milwaukee, WI. Sponsored by the Association of State Floodplain Managers. Contact Leslie A. Bond, Program Chair, 1998 ASFPM Conference, P.O. Box 427, High Rolls, NM 88325. Phone: (505) 682-1359; fax: (505) 682-1369; e-mail <bond@wazoo.com>.

26-30 *Specialty Conference on Rangeland Management and Water Resources*, Reno, NV. Contact AWRA, 950 Herndon parkway, Suite 300, Herndon, VA 20170-5531. Phone: (703) 904-1225; fax: (703) 904-1228.

June

1-3 *First International Conference on Geospatial Information in Agriculture and Forestry*, Lake Buena Vista, FL. Contact ERIM, P.O. Box 134001, Ann Arbor, MI 48113-4001. Phone: (313) 994-1200, ext. 3234; fax: (313) 994-5123; e-mail: <www.erim.org/CONF/conf.html>.

- 5-9 *Balancing Resource Issues: Land, Water, People*, San Diego, CA. Annual conference of the Soil and Water Conservation Society. Contact: Soil and Water Conservation Society, 7515 Northeast Ankeny Road, Ankeny, IA 50021-9764. Phone: (515) 289-2331; fax: (515) 289 1227; web site: <<http://www.swcs.org>> or e-mail: <swcs@swcs.org>.
- 7-9 *Monitoring: Critical Foundations to Protect Our Waters*, Reno, NV. Contact Joanne Kirklin. Phone: (405) 810-4440; fax: (405) 842-7712; e-mail: <jkurklin@usgs.gov>.
- 7-12 *The Land-Water Interface: Science for a Sustainable Biosphere*, Waco, TX. Contact the American Society of Limnology and Oceanography, 5400 Bosque Boulevard, Suite 680, Waco, TX 76710-4446. Phone: (800) 929-ASLO; e-mail: <business@aslo.org>.
- 22-24 *Carolina Bay Ecosystems: The State of Our Understanding*, Pembroke, NC. Contact Morgan A. McClure, Carolina Ecological Services, 2411 Savannah Highway, Charleston, SC 29414. Phone: (803) 556-9795; fax: (803) 571-0275; e-mail: <mcclure@jwu-sc.edu>.
- 26-28 *Our New England Waters: Watershed Stewardship for the Next Millennium*, the Fifth Annual New England Lakes and New England Regional Volunteer Monitoring Conference, University of New Hampshire, Durham, NH. To submit summary submissions or for more information, contact Jeff Schloss, University of New Hampshire Cooperative Extension, 108 Pettee Hall, 55 College Road, Durham, NH 03824-3599. Phone: (603) 862-3848; fax: (603) 862-0107; e-mail: <jeff.schloss@unh.edu>.

July

- 11-19 *National Clean Boating Week*. A nationwide celebration of boating on clean water, including educational programs, demonstrations, and activities to promote protecting boating waters. Contact the Marine Environmental Education Foundation at (401) 782-2116; e-mail: <goMEEF@aol.com>.

August

- 24-28 *Meeting on Water Quality Standards, Water Quality Criteria, and Implementation, including Water Quality-Based Permitting*, Philadelphia, PA. Contact The Cadmus Group at (703) 998-6862; e-mail: <mrm98@cadmusgroup.com>; website: <www.epa.gov/OWM>.

September

- 21-24 *Sixth National Nonpoint Source Monitoring Workshop*, Cedar Rapids, IA. Contact Lynett Seigley or Carol Thompson, Iowa Department of Natural Resources, Geological Survey Bureau, 109 Trowbridge Hall, Iowa City, IA 52242-1319. Phone: (319)335-1575; fax: (319) 335-2754; e-mail: <lseigley@igsb.uiowa.edu> or <cthompson@igsb.uiowa.edu>.

October

- 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. Contact Paul Bertram, U.S. EPA, (312) 353-0153 or Nancy Stadler-Salt, Environment Canada, (905) 336-6271. More information can be found on the web: <www.cciw.ca/solec> or <www.epa.gov/glindicator>.

Calls for papers — Deadlines

May

- 15 *Carolina Bay Ecosystems: The State of Our Understanding*, Pembroke, NC. Submission of abstracts for invited and contributed papers as well as posters are requested for a symposium to be held July 22-24, 1998. For more information, contact Morgan A. McClure, Carolina Ecological Services, 2411 Savannah Highway, Charleston, SC 29414. Phone: (803) 556-9795; fax: (803) 571-0275; e-mail: <mcclure@jwu-sc.edu>.

August

- 1 *Coastal Zone 1999*, July 24-30, 1999, San Diego, CA. Abstracts on the human dimension, the ocean realm, the watershed perspective, and the public connection relating to coastal zone management are invited. Contacts: Martin Miller, U.S. Army Corps of Engineers Waterways Experiment Station. Phone: (601) 634-3999; fax: (601) 634-4314; e-mail: <miller@cerc.wes.army.mil> and Peter Douglas, California Coastal Commission at (415) 904-5201; or Chantal Lefebvre, Urban Harbors Institute, phone: (617) 287-5577; fax: (617) 287-5575; e-mail: <z99@mbsky.cc.umb.edu>.

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