



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

Commentary

Respect and Trust are Vital to Watershed Program Success

by Jim Meek, Environmental Consultant

EDITOR'S NOTE: See *Special Focus on Animal Waste Management* (page 2) and *Data is the Foundation for Watershed Protection* (page 23) for more information on how to build successful watershed programs.

We know programs succeed when the staff is enthusiastic, have adequate scientific information, and communicate well with their clients. Recently I participated in a review of an agricultural watershed program that closely approaches such a standard. The review focused on farmer participation; farmer acceptance, implementation, and maintenance of practices; reductions in phosphorous and parasite loadings (such as *Cryptosporidium parvum* in animal waste); and the science used to support the program. All were noteworthy, especially the relationship between the program, the staff, and the farmers.

This particular watershed has developed an organization and process that fosters trust, openness, and participation so that all share in the development, management, and implementation of the program. The council responsible for the program includes a number of farmers and is supported by an executive director and staff. The leadership and members direct the program with an energy and intensity that is almost palpable.

This watershed program has organized teams of engineers and technicians from university cooperative extension, the Natural Resources Conservation Service, and soil and water conservation districts who work with each farmer on a total-farm plan. Besides providing technical assistance, the teams strive to build a level of trust and understanding with "their" farmers because they know that a close relationship is essential to achieving acceptance, implementation, and maintenance. Such a relationship involves openness to farmers' concerns, limitations, and needs — particularly their



The CWAP logo denotes articles related to action items called for in the President's Clean Water Action Plan. See News-Notes #51 and #52 for more information on the plan.

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unspoken fears, such as the fear of losing one's livelihood or changing one's lifestyle — as well as patience and firmness about meeting the objectives finally agreed on in the farm plans. There must be two-way communication on how to reduce the impacts from NPS pollution.

This field-level approach requires agency managers to loosen control over bureaucratic procedures and on-the-ground practices, and to support the teams as they develop new ways to solve problems. It's an exciting approach that could result in hard feelings and mistrust but instead is working well in this program with the current leadership. Not only must staff accommodate an increasing workload of new plans, revisions to existing plans, and farm evaluations, but they also need to stay on top of a burgeoning array of tools and requirements — mass balance of nutrients, cost-benefit analysis, models, priority setting, risk management, and others.

They have accomplished a lot, but much more needs to happen. I believe it will, but keeping the energy and intensity in a watershed program requires attention from all participants, particularly the leaders, to give everyone's ideas and concerns a fair review. Programs like this one could benefit from cultivating some additional staff to fill positions when a team member leaves, thus honoring the farmers' commitment with their own commitment.

To build trust and respect through this process, these programs also need sound science and timely data. For example, a watershed needs an integration of its hydrology, including ground water, into its water quality analysis for a better assessment of the fate of pollutant loads. This helps us more intelligently adjust our approaches and controls/practices. Adequate monitoring of water quality quantifies success from the practices installed, and helps farmers more efficiently manage their farm operations.

The interdependence of all our actions as reflected in our analysis means farmers must practice total management, and they must have the energy and intensity of effort to do many things — and the information to make the choices and to see if it makes a difference. The data and analysis will better convince farmers on how or when to change how their farms are run, thus building trust.

An organization that is open to ideas and participation by its clients, that focuses its analysis and assistance on a client for the life of the problem, and is patient and listens, provides a dynamic, not static, process. Good science and data then provide substance to this process, showing farmers that the practices being installed justify the resources expended — and will reduce pollution and improve water quality.

Special Focus: Animal Waste Management

Striking a Protein Balance Helps Cattle, Swine Produce Less Waste

by Monica Manton Norby (reprinted from *Research Nebraska*, September 1998. University of Nebraska-Lincoln)



Animal scientists have long searched for ways to improve what goes into an animal and how the animal uses it. In the 1990s, what comes out of an animal — waste — is getting increasing attention. University of Nebraska-Lincoln's Institute of Agriculture and Natural Resources (IANR) research shows that carefully formulating the amount of protein in cattle and swine diets can decrease the nitrogen waste released into the environment and sometimes reduce feed costs.

“How we manage our feedlots is going to be a bigger and bigger problem from an environmental standpoint,” IANR Beef Nutritionist Terry Klopfenstein said.

Nitrogen is one of the waste products when cattle digest protein. It causes strong odors when released into the air as ammonia and can become nitrate, a potential water pollutant. IANR researchers studying how efficiently beef cattle, dairy cattle, and swine use dietary protein have found that rations often supply too much protein and that animals can perform well on less.

Klopfenstein, who has studied protein use in beef cattle for 30 years, was instrumental in writing the new National Research Council (NRC) Nutrient Requirements for Beef Cattle, released in April 1998. The new NRC model classifies protein as either rumen degradable or rumen

undegradable. In cattle's complex digestive systems, rumen microbes digest feed. Rumen degradable protein fuels these microbes. Rumen undegradable protein passes through the rumen and the animal absorbs it for muscle growth. When cattle eat excess protein, both types produce nitrogen waste.

"The main idea about waste management is that if you don't overfeed, the animal doesn't over-excrete," Klopfenstein said. Klopfenstein used the NRC's computer program to predict feedlot cattle's optimum daily protein needs. "Now we can change the feed protein amount every two weeks, as opposed to 180 days in the past," he said. The more balanced the diet, the less waste nitrogen.

Cattle fed the NRC diet containing 15 percent less protein released 37 percent less nitrogen in urine. This diet costs the same as other diets and produces the same average daily gains in weight and feed-to-gain ratios.

Dairy scientist Rick Grant formulated a dietary supplement high in rumen undegradable protein that increases milk production and yields better protein response with minimal nitrogen waste. Lactating dairy cattle eat a high-quality alfalfa diet rich in degradable protein. Grant wanted to use feather meal, an inexpensive source of undegradable protein, to better meet animals' requirements without feeding more protein. But he had to solve one problem.

"Feather meal alone doesn't supply the right balance of amino acids to increase milk protein, but mixing it with blood meal gave a good balance," Grant said. Feeding lactating cows an 85 percent feather meal/15 percent blood meal mix along with alfalfa rations minimizes total protein fed, maintains milk production, and produces higher protein milk for about the same cost as conventional rations.

"We know from previous research that reducing the protein input will mean less nitrogen is excreted, so that's a benefit, too," Grant said.

Swine scientist Phil Miller found that decreasing crude protein fed to swine from 20 to 16 percent reduced ammonia released from waste by 70 percent. This diet required mixing synthetic amino acids with feed, an added expense, but one that may become more economically feasible in the future, Miller said.

"Undigested nitrogen is a prime suspect in producing swine containment facility odors, which is becoming a real issue," Miller said. "Manipulating diet in this way is probably going to be important down the road."

The Southeastern Poultry and Egg Association helps fund Grant's research. The Nebraska Pork Producers Association helps fund Miller's research.

[For more information, contact Terry Klopfenstein, University of Nebraska, Lincoln, NE 68583-0908. Phone: (402) 472-6443; e-mail: ansc825@unlvm.unl.edu. Or contact Rick Grant, C220j Animal Science Complex, University of Nebraska, Lincoln, NE 68583-0908. Phone: (402) 472-6442; e-mail: ansc801@unlvm.unl.edu. For more information about NRC's program to tailor rations to cattle's needs, contact National Academy Press, 2101 Constitution Ave. NW, Lockbox 285, Washington, DC 20055; Web site: www.nap.edu.]

Maryland Program Moves Manure



Maryland farmers can now take advantage of two new manure management assistance programs established by the state's Water Quality Improvement Act (WQIA) of 1998. Together, the Poultry Litter Transportation Pilot Project and the Manure Matching Service give livestock producers alternatives for addressing one of their most vexing problems. The dilemma is that specialized modern agriculture often separates livestock operations that produce nutrient-rich manure from the cropping operations that can use it.

Poultry Litter Transportation Pilot Project

Supported by the Maryland Department of Agriculture and area poultry companies, the four-year Poultry Litter Transportation Pilot Project provides cost-share assistance of up to \$20 per ton of poultry litter. The funds offset the costs of poultry litter testing and loading and the transportation costs for transferring poultry litter from farms with excess litter to farms that can use it efficiently.

"We are very optimistic that this poultry litter pilot transportation project will effectively move poultry litter to farming operations where it can be successfully used as fertilizer in accordance with agriculture nutrient management plans. This will benefit agricultural production while at the same time protecting the environment," says Maryland Secretary of Agriculture Henry A. Virts.

For 1999, \$750,000 in state funds has been allocated to the project, and the five poultry companies on the Eastern Shore have collectively agreed to match state funding. The project can transport between 60,000 and 70,000 tons of litter annually and is available to poultry farmers throughout the state. Added incentives will be offered to move poultry litter away from the lower Eastern Shore counties of Dorchester, Wicomico, Worcester, and Somerset.

Farmers can make their own arrangements for the transfer of litter or use the Department of Agriculture's Manure Matching Service to assist with the initial contact. Supply and demand will establish the market and price.

The Maryland Agriculture Water Quality Cost-Share Program will administer the funds for this program, and funds provided will not be calculated against the per-farm allowable limit for cost-share assistance. Under the project, farmers may send litter out of state and still receive financial incentives.

To participate, a sending poultry farm must certify that the operation has an insufficient amount of land to use litter produced on the farm for crop production based on a nutrient management plan, or has land identified as having an excessive level of phosphorus. Likewise, for land application, a receiving farm must consider the phosphorus levels in the soil before applying litter in accordance with a nutrient management plan. It is anticipated that the project will encourage interest in developing alternative uses for poultry litter within the private sector since receivers who have an alternative use are also eligible to participate in the project.

Manure Matching Service

The Manure Matching Service links farmers with excess manure with farmers who can safely use the manure as a nutrient source. The goal of the program is to protect water quality by fostering efficient land application and alternative uses of manure.

Maryland's Manure Matching Service will support transport programs such as the Poultry Litter Transportation Pilot Project and may also support the development of alternative animal waste management technologies, such as burning for cogeneration, fertilizer manufacturing, and composting.

The service collects information from a participating farmer about the source, nutrient value, condition, and price of manure and matches it with the location, nutrient, and timing needs of recipients. This helps to ensure a match that meets the needs of both the sending farm and the receiving farm. While the Maryland Department of Agriculture sets no specific value on manure, it encourages farmers to look at its economic and agronomic values.

[For more information, contact the Maryland Department of Agriculture, 50 Harry S. Truman Parkway, Annapolis, MD 21401. Phone: (410) 841-5880; Web site: www.mda.state.md.us.]

Cattle Management Helps Ward Off Pathogens



Just over two years ago, a public health controversy pitted ranchers against AIDS victims in San Francisco. The uproar was sparked by fears that cattle grazing within the Southern Alameda Creek watershed might contaminate drinking water with pathogens dangerous to those with compromised immune systems. Neighboring landowners were concerned that loss of grazing on San Francisco Public Utilities Commission lands would threaten their lands with catastrophic wildfire. But that was before the development of a plan that manages cattle to reduce risks to human health.

The Southern Alameda Creek Watershed spans 140,000 acres, from the town of Sunol south to Mt. Hamilton in Santa Clara County. The San Antonio and Calaveras Reservoirs within the Southern Alameda Creek watershed are part of San Francisco's water collection, storage, and

distribution system serving more than two million people. Land use in the area has been almost exclusively cattle grazing for generations.

Cattle, especially calves, are potential carriers of *Cryptosporidium parvum*, a tiny protozoan that causes gastrointestinal illness in a broad range of mammals, including humans. Infected animals can contaminate surface water with their feces and spread the disease. The illness can be life-threatening in individuals with weakened immune systems such as cancer patients receiving chemotherapy and AIDS patients. Cattle, humans, pigs, horses, dogs, and a wide variety of wildlife species are known to shed *C. parvum* in their feces.

The Southern Alameda Creek Watershed Project, administered by Alameda County Resource Conservation District, worked with stakeholders to develop a risk reduction-grazing resource management plan for lands owned by the Commission in the Alameda watershed. The plan grew out of a 1997 resolution directing the Commission to solicit and obtain from the Conservation District and the livestock industry a comprehensive BMP plan designed to include risk assessment and monitoring programs guarding against *Cryptosporidium* and other waterborne pathogens. Numerous stakeholders participated in the development of the grazing management strategy, and a plan was submitted to the Commission on April 30, 1997. As a result, the Commission voted unanimously to allow cattle grazing to continue on their Southern Alameda Creek Watershed property.

The plan adopted by the Commission was loosely based on an approach used in food industries to guarantee food safety. The approach emphasizes control of the food process as far "upstream" in the processing system as possible. Similar challenges and objectives exist for water quality.

The grazing strategy contains a series of management practices designed to guard against *C. parvum* and other waterborne pathogens. The guiding principles and site-specific protections established for the watershed property include

- Excluding calves less than four months old from areas directly adjacent to the reservoirs.
- Restricting calving season from August through October.
- Locating water developments and supplemental feeders away from stream channels.
- Maintaining a general herd health program.
- Managing stocking rates to retain adequate vegetation cover.
- Controlling feral pig densities.

Other measures included encouraging land stewardship by basing grazing fees on animal numbers rather than acres, granting longer-term leases (5 years, as opposed to 1 year), and making the fee per animal unit correspond with fluctuating market prices.

Major funding for this project was provided by EPA, the Alameda Countywide Clean Water Program, the Alameda County Water District, and The Nature Conservancy. Technical assistance came from NRCS, the University of California Cooperative Extension, and the Alameda County Resource Conservation District. The continued success of this project depends on the cooperation of resource managers and landowners, including the San Francisco Water Department.

[For more information, contact Sheila Barry, Alameda County Resource Conservation District, 1996 Holmes Street, Livermore, CA 94550. Phone: (925) 371-0154; e-mail: sheilabarry@hotmail.com.]

Idaho Dairymen's Pledge to Clean Up Their Act Pays Off



The switch from small-scale, family-run dairy farms to larger herds with more than 50 head of cows has led to growing concern about water quality in states with a high number of dairy operations. In October of 1995 leaders in Idaho's dairy industry came together to sign a Memorandum of Understanding (MOU) for a common-sense, result-oriented dairy waste inspection program on all Idaho dairy facilities as a preemptive strike in the fight against dairy waste discharges to surface and ground water. The resulting Idaho Dairy Pollution Prevention Initiative has made great strides toward its goal.

Previous Inspections Fell Short

According to Marv Patten, one of the Initiative's originators at the Idaho State Department of Agriculture (ISDA), before the MOU was signed, ISDA conducted only farm sanitation inspections related to the production and quality of milk. The inspections covered milk cow housing areas, water supply, milk quality, milk parlors, and so forth. They did not cover the design, construction, and management of waste systems or the treatment or land application of nutrients. In addition, the Idaho Division of Environmental Quality (DEQ) and EPA conducted periodic Clean Water Act-related inspections. But those inspections were simply insufficient for the number of dairy farms in Idaho; only about 50 to 80 farms were inspected each year. After the MOU was signed, that number jumped to more than 2,500 annual inspections (many facilities are inspected more than once each year).

Program Highlights

EPA Region 10, Idaho DEQ, ISDA, the Idaho Dairymen's Association, Inc., and local dairy producers were all partners in the 1995 MOU. Each partner has separate responsibilities. The program was created to eliminate multiagency duplicative inspections, to increase inspection presence, and to provide service/compliance schedules to correct any problems. To make the inspection program run even more smoothly, all inspections are logged into a detailed database that includes inspection history, non-compliance events, complaints, discharges, corrective actions, and other information.

Although the number of milk cows in the United States has continuously decreased since its peak in 1940, the proportion of larger herds (50 or more head per farm operation) has steadily increased. According to the National Agricultural Statistics Service (NASS), there were 1,300 dairy operations of varying sizes in Idaho in 1998. Of those, 320 had more than 200 head of dairy cows each. All those cows mean a lot of manure. In fact, it has been estimated that one adult dairy cow produces more than 5,000 gallons of manure each year, which includes more than 200 pounds of nitrogen, 43 pounds of phosphorus, and 138 pounds of potassium.

General policies set forth in the MOU include the following:

- Inspections of dairies should include a visual inspection of the waste containment and runoff control facilities.
- Inspections of dairies will be conducted so that reliable information concerning operating conditions applicable to water quality requirements will be documented.
- Inspections may include the collection of discharge samples and photographs. Any sampling of discharges and subsequent analyses will be conducted according to procedures subsequently approved by the ISDA, IDEQ, and EPA with consultation with IDA.
- The ISDA, IDEQ, and EPA may identify those instances where enforcement action might be appropriate. An annual midyear review meeting will be held each April to address issues regarding waste management and the environment.
- Penalties for "bad actors" range from revoking dairy farm permits to withholding money made for any milk produced while not in compliance.

Adding It All Up

ISDA's Dairy Bureau absorbed the start-up cost of the initiative (\$20,000) in their normal budgeting process. The new waste program was then integrated into existing Grade A and B inspection programs, which are funded by a mill levy on pounds of fat produced or processed. Average annual operating costs of the program have ranged from \$126,000 to \$168,000.

Milking It for All It's Worth

Seven months after the MOU was signed, all dairy facilities (1,150 that year) had been inspected. The inspections revealed that approximately 50 percent of the facilities had serious non-compliance problems, including some discharges to surface and ground water during only moderate weather events. Approximately 23 percent of the facilities were committing discharge violations. Since the new inspections began, more than 95 percent of delinquent facilities have corrected their problems. The new program provided reasonable time frames to correct problems without undue economic hardship. Today, less than 5 percent of all Idaho dairies have non-compliance problems and less than 1 percent have discharge violations.

As with any complex problem, working together is a large part of the solution. Cooperative efforts to address complex environmental problems like this are becoming more commonplace in a time

when concerns are high but budgets are tight. Says Patten, "It is amazing what you can accomplish when you have progressive industry leaders working with a state agency to resolve emotional and complicated environmental issues."

Idaho's dairy industry leaders have now started to tackle another problem. They are lobbying for mandated Nutrient Management Plans based on lower phosphorus thresholds.

[For more information, contact Marv Patten, Chief, Bureau of Animal Industries, Idaho State Department of Agriculture, 2270 Old Penitentiary Road, Boise, ID 83712. Phone: (208) 332-8550; fax: (208) 334-4062.]

New Animal Waste Laws Spring Up Across the Nation

Maryland Focuses on Phosphorus



Maryland's Water Quality Improvement Act (WQIA) of 1998 has been described as the most comprehensive farm nutrient control legislation in the country. The law marks a transition from voluntary to mandatory nutrient management and a shift toward phosphorus-based nutrient management.

The most far-reaching requirement of the WQIA is that all agricultural operations with annual incomes greater than \$2,500 or more than eight animal units (one animal unit equals 1,000 pounds of live weight) must have and implement a nitrogen- and phosphorus-based nutrient management plan by 2005.

The act specifies that nutrient management plans consider both nitrogen and phosphorus application rates. In the past, when animal manure or sludge was applied, the amount of recommended materials was based on crop nitrogen needs. But because the amount of phosphorus in manure is generally high relative to nitrogen and the nutrient needs of growing crops, this practice resulted in substantial overapplication of phosphorus.

Previously, it was thought that controlling erosion controlled phosphorus loss, but recent research has shown that dissolved phosphorus in runoff can be high, even without erosion, on soils with excessive phosphorus levels.

This finding is the reason the act requires that nutrient management plans be balanced for both nitrogen and phosphorus. There are at least three approaches to phosphorus-based plans.

The simplest would be to directly follow soil test recommendations. This approach assumes that agronomically and environmentally important phosphorus levels are the same, which does not appear to be the case. This approach would greatly restrict phosphorus application on soils with optimum to slightly excessive levels without considering other site-specific factors that affect phosphorus loss.

The second approach would be to establish "critical" soil test values that limit phosphorus application. In this scenario, a level might be established at which only as much phosphorus as the crop removes could be applied, while for soils at some higher level no additional phosphorus could be applied.

Agricultural scientists have objected to both approaches since their research suggests that many site-specific factors influence the potential for phosphorus loss. They have proposed the use of a "Phosphorus Site Index."

This Phosphorus Site Index is a generalized national index that has been developed and is now being adapted by the University of Maryland for possible use in Maryland (currently, only a draft version of the index is available). It evaluates slope, runoff potential, proximity to surface water, soil phosphorus levels, and fertilizer/manure application rates and methods. The scientific community believes that site-specific assessments using this tool provide the most comprehensive evaluation of potential environmental impacts without restricting phosphorus application to low-risk sites.

Another aspect of Maryland's new law requires that by December 31, 2000, all contract feed for chickens must include phytase or some other enzyme or additive that reduces phosphorus to the maximum extent commercially and biologically feasible.

To facilitate the transition, Maryland has committed \$800,000 per year for at least three years for agricultural research and education programs to expedite implementation of technologies that will help farmers meet the WQIA requirements. These activities could include research and extension programs on composting, analysis of the pilot transport program (see "Maryland Program Moves Manures" on page 3), animal nutrition management, development of a phosphorus index, and phosphorus dynamics in soils.

Virginia Has New Poultry Manure Law

Virginia recently passed landmark legislation that will, for the first time, regulate the management of poultry manure. The law requires the State Water Control Board to develop regulations by October 2000 that will ensure the proper storage, management, and disposal of the more than one billion pounds of manure produced annually by Virginia's poultry industry. Runoff from uncovered manure piles and farm fields where manure has been over-applied as fertilizer contaminates drinking water and is a major source of the nutrient pollution plaguing the Chesapeake Bay and its tributaries.

The law includes provisions that require poultry farmers with more than 20,000 birds to obtain a general permit from the Virginia Department of Environmental Quality by October 2001. It also requires that phosphorus be addressed in nutrient management plans on poultry farms, and that poultry processing companies play a role in helping farmers find and fund alternative uses and fund transportation for excess manure.

"This is a fair and responsible law that provides meaningful regulation of poultry manure and respects the unique needs of poultry farmers and processors," said Joseph Maroon, Chesapeake Bay Foundation Virginia Executive Director. "We are very pleased that all the stakeholders were able to agree on what we believe is one of the most significant and beneficial water quality measures in recent years."

Washington State Registers and Inspects Its Dairies

Nearly all of Washington's 765 dairies have complied with a new law that requires all licensed dairy producers to register with the state Department of Ecology. The registration process provides information about the number of farms and animals and data about waste management efforts. The law also requires that all farms develop and carry out an approved dairy waste management plan by the end of 2003.

The state's Dairy Nutrient Management Act, revised in early 1998, originally gave farmers until September 1, 1998, to register their farms. After extending the deadline to mid-October, 98 percent of Washington dairies had registered. Eight operators who did not comply were fined \$100 each.

Eight departmental inspectors have already begun the second phase of implementation — farm inspections. Under the new law, all Washington dairies will have been inspected by October 2000. The inspectors look for evidence of actual or potential water quality violations, identify corrective actions, and monitor development of dairy nutrient management plans. According to Phil KauzLoric of the Department of Ecology, only about 20 percent of the farms inspected so far have been found to have problems.

To provide direction and oversight for the new program, the Department of Ecology formed an advisory and oversight committee that includes eight dairy producers and representatives from two conservation districts, the state conservation commission, EPA, the Natural Resources Conservation Service, the shellfish industry, a local health department, an environmental advocacy organization, and the Department of Ecology. The committee recommends inspection procedures and reviews new technologies for managing dairy waste.

The Department of Ecology estimates that agriculture accounts for some 60 percent of the pollution in Washington streams, with widespread pollution from dairy farms making up a significant portion.

[For more information, contact Phil KauzLoric, Washington State Department of Ecology, Water Quality Program, P.O. Box 47600, Olympia, WA 98504-7600. Phone: (360) 407-6413.]

Oklahoma Requires Hog Licensing

In Oklahoma, Governor Frank Keating signed a hog regulation bill in June 1998. "This law sets forth strong but reasonable setback requirements and imposes fees on the swine industry, while also seeking to protect the small family hog farmer," according to Keating. The new requirements include mandatory licensing for swine animal feeding operations with more than 2,500 hogs, a 10-foot separation between ground water and lagoon bottom for licensed managed feeding operations, permits prior to construction of licensed managed feeding operations, water and soil testing, and training and education for employees of licensed managed feeding operations in the areas of waste management and odor control.

[For more information, contact the Oklahoma Department of Agriculture, 2800 N. Lincoln Boulevard, Oklahoma City, OK 73105-4298. Phone: (405) 521-3864; fax: (405) 522-0909.]

319 National Monitoring Program Project Documents Improved Water Quality from BMPs at Dairy Farm

by Laura Lombardo, Water Quality Extension Associate, and Dan Line, Water Quality Extension Specialist, North Carolina State University Water Quality Group



Monitoring results are documenting that BMPs installed three years ago as part of a National Monitoring Program (NMP) project are reducing nutrients and sediment in a North Carolina watershed that includes several livestock operations. The Long Creek NMP Project is one of 22 comprehensive watershed monitoring projects in the United States supported by EPA funds authorized by section 319 of the Clean Water Act. NMP projects are unique in that their focus is long-term (5 to 10 years), with a goal of documenting water quality improvements associated with implementation of nonpoint source controls.

Because of the natural variability of hydrologic systems, long-term monitoring is critical to showing statistically significant changes in water quality after BMP implementation. Another key reason for long-term monitoring is that improvements in water quality associated with BMPs take time to occur. For example, the effects of planting a riparian zone are not immediate, and improvements increase as vegetation matures.

The Watershed

The 11,392-hectare (ha) Long Creek watershed (more than 28,000 acres), located 30 miles west of Charlotte, North Carolina, was selected for inclusion in the NMP for a number of reasons: Pre-BMP monitoring data were available; the effectiveness of BMPs could be documented more effectively because of the cooperation and support of the local conservation district, the Natural Resources Conservation Service, government officials, and farmers; the watershed was located almost entirely in one county, giving it only one set of government agencies to work with; and the county had a history of excellent cooperation and interest in water quality, having previously funded a short-term monitoring project and a countywide land-use inventory as part of a natural resources inventory.

The watershed has a mixture of agricultural and urban/industrial land uses, including three dairy operations and several beef and horse farms. Crop and dairy production are believed to be major contributors of nonpoint source pollutants to the creek.

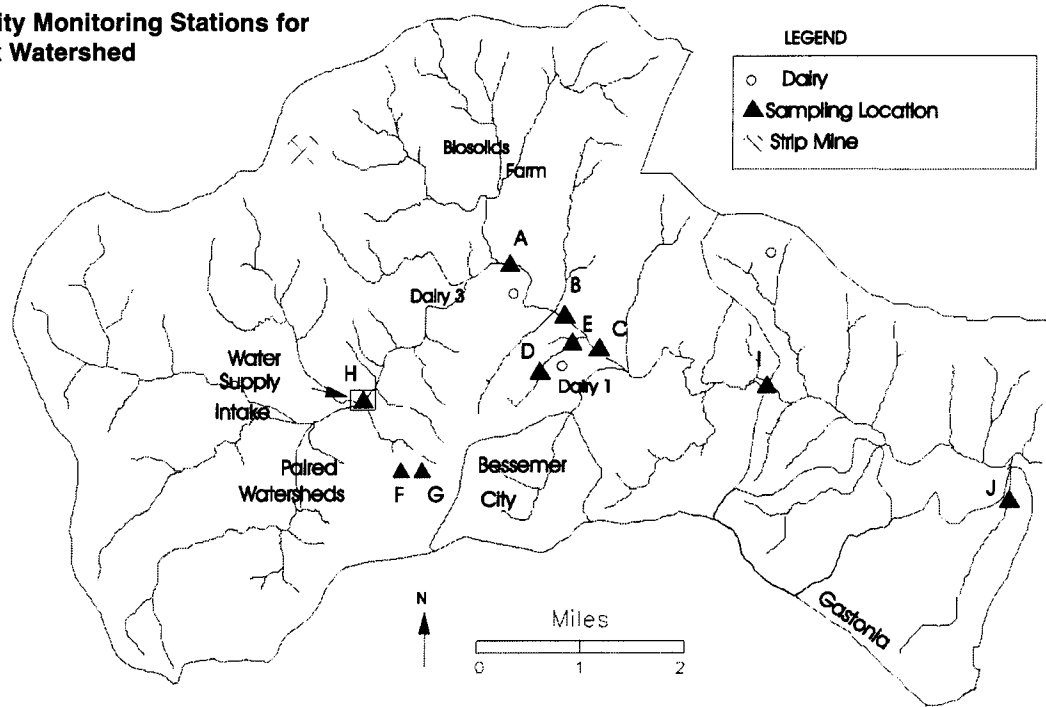
High suspended sediment loads, nutrients, and bacteria have impaired sections of the creek, which is the primary water supply for Bessemer City. The creek used to serve as a water supply for the nearby city of Gastonia until the late 1980s, when poor water quality convinced the city to turn elsewhere for water. One section of Long Creek is listed as support-threatened by the state because fecal coliform, excessive sediment, and nutrient loading from agricultural and urban nonpoint sources have degraded biological habitat.

Pre-BMP Monitoring

One component of the Long Creek project employs an upstream/downstream monitoring design located in a tributary that drains the largest dairy farm in the watershed. The upstream monitoring station (site D) samples runoff from a 42-ha area (104 acres) consisting mostly of pasture for 50 to 100 cattle. The drainage area also includes a residential area and a small metal fabricating business.

In addition to runoff from upstream of site D, the downstream station (site E) monitors runoff from the 14.6-ha area (36 acres) between sites D and E, which is heavily used by up to 200 cattle for grazing, exercise, and feeding. Prior to BMP implementation in 1996, vegetation between sites D and E was sparse, with approximately half of the area denuded or covered with impervious surfaces such as roofs, paved holding areas, or farm roads. The streambanks between sites D and E were eroding quickly, partially because the cows had unlimited access to the stream.

Water Quality Monitoring Stations for Long Creek Watershed



Water quality monitoring at the dairy farm began in April 1993. Since then, the project technician has collected weekly grab samples and storm event samples, which are analyzed for nitrite plus nitrate-nitrogen (NO₂₊₃), total Kjeldahl nitrogen (TKN), total phosphorus (TP), and total suspended sediment (TSS) concentrations, as well as fecal coliform (FC) and fecal streptococci (FS) counts. Discharge and rainfall have been monitored continuously.

Water Quality Extension Specialist Dan Line calculated annual pollutant export from the watershed prior to BMP implementation using discharge and grab and storm event data.

BMPs

The project technician, the farmer, and the Gaston Soil and Water Conservation District installed BMPs at the dairy farm in February 1996. The BMPs installed between sites D and E included livestock exclusion fencing, an alternative water system, improved stock trails, heavy-use-area stabilization, riparian area establishment, and waste storage and handling. In addition, an alternate watering system was installed upstream of site D.

Annual Pollutant Export and Runoff from Areas Draining to Sites D and E Before BMP Implementation, and Percent Load Reduction after BMP Implementation				
Pollutant	SITE D: LIGHT USE PASTURE		SITE E – SITE D: HEAVY USE AREA	
	Pre-BMP Load (kg/ha-yr)	Post-BMP Reduction	Pre-BMP Load (kg/ha-yr)	Post-BMP Reduction
NO ₂₊₃	10.0	47%	34.4	34%
TKN	15.1	38%	427	73%
TP	5.3	40%	181	74%
TSS	2,160	74%	39,530	80%
TS	3,428	73%	55,000	81%
Runoff (mm/yr)	510	—	1,000	—

The farmer, Melvin Kiser, provided an in-kind contribution of 25 percent of the total cost of installing BMPs, including labor, supplies, and equipment.

Post-BMP Monitoring Results

Water quality monitoring and analysis continues, with weekly grab sampling and storm event sampling at monitoring sites D and E. Analysis of 80 weeks of data collected since the installation of BMPs documents decreases in pollutant loads of NO₂₊₃, TKN, TP, TSS, FC and FS counts (see table). Statistical analysis of pre- and post-BMP data indicates that decreases in nitrogen, phosphorus, and sediment loads since BMP implementation are significant and thus are not likely to be due to random chance or climatic changes. In addition, statistical analysis shows that decreases in bacterial counts at site E are also significant. A 90 percent reduction in both FC and FS counts occurred at site E, while bacterial levels at site D remained nearly the same. Additional reductions are expected as the riparian vegetation along the tributary becomes more established.

Results have exceeded expectations. Pollutant loads and concentrations have decreased up to 80 percent. (A minimum 30 to 40 percent reduction is generally required to document a statistically significant reduction in pollutant loads and concentrations). There is a visible difference in the site. Although the denuded areas are still there, the riparian area is now vegetated, with planted trees reaching 10 feet high and volunteer vegetation 3 feet high.

The Long Creek project will continue until 2001. The project team is planning to install fenceline feeding systems that prevent rainfall and runoff from washing concentrated animal waste directly to the stream. Post-BMP monitoring will continue and data will be reanalyzed for statistically significant differences in pre- and post-BMP water quality.

[For more information on this project, contact Dan Line, Water Quality Extension Specialist, NCSU Water Quality Group, Box 7637, Raleigh, NC 27695-7637. e-mail: dan_line@ncsu.edu.]

National Chicken Council Proposes Solutions To Water Quality Concerns



The National Chicken Council has proposed a strategy to address nonpoint source issues related to the use of dry poultry litter as a fertilizer or soil amendment.

“The voluntary strategies outlined in this overall program will ensure that the broiler industry is taking a lead role in promoting the protection of the environment and water quality,” said John Chlada, chairman of the Poultry Industry Environmental Dialogue. “This is a feasible, doable plan that will give us a firm handle on the nonpoint source issue.”

The Dialogue, which includes representatives of the broiler, turkey, and egg laying industries; USDA and EPA; the American Farm Bureau Federation; and state and regional environmental and water agencies, is working to create a consensus-based approach to nonpoint source issues. The final document is expected to be submitted to the U.S. government as a contribution to the joint USDA-EPA policy on animal feeding operations (see “USDA and EPA Release New Strategy to Address Runoff from Animal Feeding Operations” on page 12).

The Environmental Framework and Implementation Strategy for Poultry Operations was adopted by the National Broiler Council board of directors last November and will be implemented voluntarily by its member broiler companies, who are responsible for 95 broiler operations. The companies work with independent farmers who produce chickens under contract.

Under the framework, litter management plans would be developed that address the nutrient value of the litter and effectively plan for its use. The litter management plans will include provisions for proper storage of litter, record keeping, management of dead birds, nutrient value for land application, alternative use in lieu of land application, transportation, and notification of the appropriate regulatory agencies.

Farmers who have signed contracts since January 1, 1993, and company-owned farms should have nutrient management plans by January 1, 2001. Other farmers will have additional time depending on how long they have been in business. The staggered schedule was adopted after the Natural Resources Conservation Service warned of a lack of capacity for developing the plans in a short time period.

The framework encourages farmers to place litter management plans in the context of a whole-farm nutrient management plan that also considers chemical fertilizers, other animals such as cattle, and row crops.

The framework calls on farmers to make annual reports to the appropriate state agency on the amount of litter removed from growout houses, the amount applied to land for its nutrient value, and the amount transferred to alternative use. Integrators (companies that contract with farmers) are expected to ensure that their producers have litter management plans and make the annual report. Regulatory agencies have the right to inspect the litter management plans and records pertaining to them, and the right to investigate complaints related to the producers' or integrators' operation.

With regard to funding, the framework says that integrators will "continue to fund projects through their traditional channels" and "will increase funding as needed to meet the national goals of water quality improvement and protection." Integrators have provided support for nutrient management education programs in North Carolina, Arkansas, Oklahoma, and other states.

The framework states that integrators can also make direct payments to farmers, provide low-interest loans, and provide funding for research and nutrient management training programs. Producers can also tap public funding, which includes USDA's Environmental Quality Incentive Program, the Conservation Reserve Program, and the Small Watershed Protection Program; EPA's Nonpoint Source Management Program; and the states' Clean Water Act State Revolving Fund.

The plan was drawn up specifically for broiler operations, which produce dry litter. The Dialogue also includes the turkey industry and egg producers, many of whose operations produce wet litter. Council officials expect that the Dialogue will modify the plan to apply to other poultry industries.

Organizations participating in the Dialogue include the National Chicken Council, the National Turkey Federation, the U.S. Poultry & Egg Association, United Egg Producers, the American Farm Bureau Federation, the National Association of State Departments of Agriculture, the Association of State and Interstate Water Pollution Control Administrators, the National Association of State Conservation Agencies, the Environmental Council of the States, poultry associations from several states and regions, USDA, and EPA.

[For more information, contact Richard L. Lobb, National Chicken Council, 1155 Fifteenth Street, NW, #614, Washington, DC 20005-2706. Phone: (202) 296-2622; fax: (202) 293-4005.]

Notes on the National Scene

USDA and EPA Release New Strategy to Address Runoff from Animal Feeding Operations



Vice President Gore announced in March the completion of a comprehensive federal strategy to help clean up rivers, lakes, and coastal waters by reducing polluted runoff from all livestock operations.

"Just over a year ago, President Clinton and I announced a new Clean Water Action Plan to help ensure clean, safe water for all Americans," the Vice President said. Referring to the new Unified National Animal Feeding Operation Strategy, Gore continued, "We've made tremendous progress over the past year. These new steps will further strengthen our partnerships with communities and farmers across the country to restore our waterways and protect public health."

The CWAP identifies polluted runoff as the most important remaining source of water pollution and provides for a coordinated effort to reduce polluted runoff from a variety of sources. As part of this effort, the CWAP called for USDA and EPA to develop a Unified National Strategy to minimize the water quality and public health impacts from animal feeding operations (AFOs).

USDA and EPA issued a draft of this Strategy on September 16, 1998, and requested public comment during a 120-day period. In addition, 11 national "listening sessions" were held throughout the United States to discuss the draft Strategy and hear public feedback. The final Strategy reflects written comments received as well as issues raised during the listening sessions.

Background

AFOs are agricultural enterprises where animals are kept and raised in confined situations. Approximately 450,000 AFOs in the United States concentrate animals. These operations include feed, manure and urine, and dead animals, all concentrated on a small land area. USDA data indicate that the vast majority of farms with livestock are small — about 85 percent of these farms have fewer than 250 animal units (AUs), where an AU is equal to roughly one beef cow. (One AU is generally defined as 1,000 pounds of live weight of any given livestock species or any combination of livestock species.) About 6,600 AFOs had more than 1,000 AUs in 1992 and are considered to be large operations.

As a result of domestic and export market forces, technological changes, and industry consultation, the past several decades have seen substantial changes in the animal production industry. Despite USDA support for sustainable agricultural practices, these factors have promoted expansion of confined production units, with growth in both existing areas of the country and in new areas; integration and concentration of some of the industries; geographic separation of animal production and feed production operations; and, most importantly, the concentration of large quantities of manure and wastewater on farms and in some watersheds, resulting in a number of risks to water quality and public health. Manure and wastewater from AFOs have the potential to contribute pollutants such as nutrients (e.g., nitrogen, phosphorus), organic matter, sediments, pathogens, heavy metals, hormones, and antibiotics to the environment. These pollutants can cause water quality and public health impacts, such as contamination of drinking water supplies and fish kills.

USDA and EPA's National Performance Expectation

To minimize water quality and public health impacts from AFOs and land application of animal waste, the Strategy encourages all AFO owners and operators to develop and implement technically sound and economically feasible site-specific Comprehensive Nutrient Management Plans (CNMPs). A CNMP identifies actions that will be implemented to meet clearly-defined nutrient management goals for an agricultural operation. These actions include the following:

- Modifying animal diets to reduce the amounts of nutrients in manure.
- Handling and storing manure properly to prevent water pollution from AFOs.
- Applying manure to the land in accordance with the CNMP to minimize water quality and public health risk.
- Implementing such practices as crop residue management, grazing management, and other conservation practices to minimize the movement of pollutants to surface and ground water.
- Keeping detailed records that indicate the quantity of manure produced and how the manure was used.
- Finding alternative uses of manure, such as the sale of manure to other farmers, composting and sale of compost to home owners, and using manure for power generation.

Relationship of Voluntary and Regulatory Programs

Voluntary and regulatory programs serve complementary roles in providing AFO owners and operators and the animal agricultural industry with the assistance and certainty they need to achieve individual business and personal goals, and in ensuring protection of water quality and public health.

Voluntary Program for Most AFOs

For the vast majority of AFOs, voluntary efforts will be the principal approach to assist owners and operators in developing and implementing site-specific CNMPs, and in reducing water pollution and public health risks associated with AFOs. CNMPs will be required as part of National Pollutant Discharge Elimination System (NPDES) permits. While CNMPs are not required for AFOs participating only in voluntary programs, they are strongly encouraged as the best possible means of managing potential water quality and public health impacts from these operations.

There are three types of voluntary programs to assist AFO owners and operators. USDA and EPA are both committed to promoting *locally led conservation* as one of the best ways to help AFO

owners and operators achieve their conservation goals. *Environmental education* can bring an awareness of possible water quality problems and inform AFO owners and operators about practices that will address such problems. A variety of *financial and technical assistance programs* advise AFO owners and operators in developing CNMPs and implementing solutions, and help defray the costs of approved/needed structures (e.g., waste storage facilities for small operations) and the implementation of other practices, such as installation of conservation buffers to protect water quality.

Regulatory Program for Some AFOs

Impacts from certain higher risk AFOs are addressed through National Pollutant Discharge Elimination System (NPDES) permits under the authority of the Clean Water Act. AFOs that meet certain specified criteria in the NPDES regulations are referred to as concentrated animal feeding operations or CAFOs.

NPDES permits will require CAFOs to develop CNMPs and to meet other conditions that minimize the threat to water quality and public health and otherwise ensure compliance with the requirements of the Clean Water Act. NPDES permits will also ensure that the animal manure from CAFOs will be used properly and require reporting on whether the permittee has a CNMP including land application of animal manure and whether it is being implemented properly. The Strategy identifies the following three categories of CAFOs that are priorities for the regulatory program:

- ***Significant Manure Production.*** Large facilities (those with greater than 1,000 animal units) produce quantities of manure that can be a risk to water quality and public health.
- ***Unacceptable Conditions.*** Facilities that have man-made conveyances that discharge animal waste to waters or have a direct discharge to waters that pass through the facility or come into direct contact with animals represent a significant risk to water quality and public health. More details on these priorities for the regulatory program can be found in the full Strategy.
- ***Significant Contributors to Water Quality Impairment.*** A facility that is significantly contributing to impairment of a waterbody or a watershed and nonattainment of a designated use is also a priority for the NPDES permitting program.

Coordination with State and Tribal Programs

States and tribes play a critical role in the development and implementation of national, state, and tribal resource protection programs. USDA and EPA expect to work with states and tribes to implement effective programs to achieve the national goal and performance expectation of this Strategy. The Strategy includes actions to address a range of state and tribal issues.

North Carolina was the country's fastest growing pork-producing state until 1997, when its governor signed into law the historic Clean Water Responsibility Act. The act includes a moratorium on new and expanded factory hog farms. It also allows counties to zone large hog farms and limits nutrient levels in rivers and streams. During the moratorium researchers at North Carolina State University have been studying the effects of animal waste on ground water and alternatives to lagoon waste systems. The North Carolina moratorium highlights a national trend toward regulating the pork industry. For more information, contact Don Reuter, North Carolina Department of Environment and Natural Resources, (919) 715-4112.

Strategic Issues

The Unified AFO Strategy addresses seven strategic issues. The discussion of each of the following strategic issues identifies several action items:

- ***Building Capacity for CNMP Development and Implementation.*** The Strategy describes actions to substantially increase AFO owners and operators' access to technical assistance for developing and implementing CNMPs.
- ***Accelerating Voluntary, Incentive-based Programs.*** The Strategy's goal is that all AFOs have CNMPs by 2009. Several actions, including review and revision of USDA's practice standards, development of CNMP guidance, fair and equitable program delivery, and options for financial assistance, are directed toward achieving this objective.
- ***Implementing and Improving the Existing Regulatory Program.*** The Strategy describes the applicability and the requirements of the existing regulatory program, identifies permitting and enforcement priorities, recognizes state and tribal CAFO permit programs, and describes EPA's plans to strengthen and improve existing regulations.

■ *Coordinated Research, Technical Innovation, Compliance Assistance, and Technology Transfer.* USDA and EPA will establish coordinated research, technical innovation, and technology transfer activities; provide compliance assistance; and establish a single information center. The two agencies are also committed to promoting sustainable agriculture and will support development of a livestock environmental issues curriculum for producers.

■ *Encouraging Industry Leadership.* The Strategy includes possible actions that USDA and EPA may take to promote industry involvement in encouraging the adoption of CNMPs and in addressing water quality problems on individual AFOs.

■ *Data Coordination.* Several kinds of data are useful in assessing and managing the water quality impacts of AFOs. USDA and EPA efforts to coordinate on data sharing will both protect the relationship of trust between USDA and farmers and provide regulatory authorities with information that is useful in protecting water quality and public health.

■ *Performance Measures and Accountability.* USDA, EPA, states, tribes, and other federal agencies will work with other stakeholders to develop an approach for measuring the effectiveness of efforts to minimize the water quality and public health impacts of AFOs.

See our Special Focus on Animal Waste Management starting on page 2 for examples of activities promoted in the strategy.

[For more information, contact your state or local NRCS office. Printed copies of the Unified National Strategy for Animal Feeding Operations can be obtained by calling USDA at (202) 720-3210 or EPA at (202) 260-7786. An electronic version of the Strategy is available on the Internet at www.epa.gov/owm/afo.htm. Additionally, copies can be ordered from EPA's National Agricultural Compliance Assistance Center through a toll-free fax-on-demand line, 1-888-663-2155. Ask for Document No. 11012 for the entire AFO Strategy or Document No. 11013 for the Executive Summary.]

CALL FOR ABSTRACTS

Effects of Animal Feeding Operations on the Environment

USGS is sponsoring an AFO workshop and is now accepting abstracts related to effects of AFOs on the quality of water resources and consequences to human and ecosystem health. Suggested topics include national and state perspectives of AFO issues; analytical methods for identification and quantification of pharmaceuticals; and preventive and remediation strategies. Abstracts must be received by May 28, 1999. The conference will be held August 30-September 2, 1999 in Fort Collins, Colorado. For more information, contact Dana Kolpin at (319) 358-3614; email: dwkolpin@usgs.gov.

Agencies Celebrate Anniversary of Clean Water Action Plan



Marking the first anniversary of the Clean Water Action Plan, EPA and eight other federal agencies have released a report on their accomplishments over the last year. The Action Plan, announced by the President and Vice President in February 1998, seeks to protect public health and restore waterways by setting strong goals and providing states, tribes, communities, farmers, and landowners with the tools and resources to meet them.

The report highlights the progress that has been made toward implementing the plan and outlines the agenda for the coming year. Following are some of the key projects completed or begun in the Action Plan's first year.

■ **Unified Watershed Assessments.** These reports are the first coordinated statements of water quality priorities in the history of U.S. clean water programs. All 50 states, the District of Columbia, 5 territories, and 18 tribes completed these assessments in a very short period of time — just 7 months after the release of the Action Plan.

■ **Identifying Priorities.** States and tribes identified those watersheds they believe are most in need of restoration during 1999 and 2000. Based on this information, additional federal funds received during that period will be directed to the designated watersheds. In addition, this information will help target the broader efforts, programs, and resources of all stakeholders, including local, tribal, state, and federal governments; citizens; interest groups; and businesses.

- **Watershed Assistance Grants.** In September 1998, the River Network, with funding from EPA, began making funds available to local watershed partnerships to support their organizational development and long-term effectiveness. Local groups can receive up to \$30,000.
- **Nutrient Criteria and Standards.** EPA has developed a multiyear strategy for the development and implementation of nutrient criteria and standards tailored to specific needs of different types of waterbodies and natural conditions around the country.
- **Conservation Reserve Enhancement Program.** Approximately \$976 million in federal funds have been committed to six states that have signed up to participate in the Conservation Reserve Enhancement Program. This program uses financial incentives to encourage farmers and ranchers to voluntarily remove sensitive land from agricultural use.
- **Promoting Conservation Through Crop Insurance.** USDA is working with private insurance companies and foundations to develop insurance programs that will enable farmers and ranchers to offset risks associated with new practices and technologies aimed at reducing or preventing pollution. Two insurance policies are already available to help farmers reduce fertilizer and pesticide usage. Other policies in the final stages of development are designed to reduce the use of fungicides and promote no-till farming methods.
- **Unified Animal Feeding Operation Strategy.** USDA and EPA recently released a national strategy to address pollution from animal feeding operations while ensuring the long-term sustainability of the livestock industry. This strategy's primary goal is to implement comprehensive nutrient management plans at all animal feeding operations by 2009 (see "USDA and EPA Release New Strategy to Address Runoff from Animal Feeding Operations" on page 12).
- **Five-Star Restoration Challenge Grant.** Announced in 1998, the Five-Star Restoration Challenge Grant is open to any public or private entity. It provides financial assistance to community-based wetland/riparian restoration projects and local natural resource stewardship.
- **Wetlands Reserve Program.** This voluntary program offers financial support to landowners for wetlands restoration projects. During 1998, roughly 212,000 acres were enrolled in this program. The Administration is requesting additional authority so that as many as 250,000 acres can be enrolled each year.
- **Stream Corridor Restoration: Principles, Processes, and Practices.** This handbook, produced by the collaboration of 15 federal agencies, provides a sound basis for restoring the natural ecology of streams and rivers. Twelve watersheds in need of restoration will be chosen to demonstrate these techniques in 1999.
- **Cleanup of Abandoned Mines.** The Action Plan calls for the addition of three to five abandoned hardrock mines to the cleanup program each year beginning in 1999. Federal land managers have worked with state, tribal, and local partners to initiate cleanups ahead of schedule, with cooperative projects begun in Colorado, Montana, and Utah during 1998.
- **Emergency Response System for *Pfiesteria* and Major Algal Blooms.** Recent outbreaks of *Pfiesteria* along the East Coast has highlighted the need for a coordinated federal response system to assist state and local governments during major outbreaks. This interagency Emergency Response Plan was distributed on August 18, 1998, and will continue to be refined and expanded.
- **Seafood Safety.** Brochures highlighting the risks associated with consuming large amounts of fish were developed in English, Spanish, and Asian languages and distributed in areas where locally caught fish pose health risks. In addition, the National Shellfish Register, which outlines the health of the nation's shellfisheries, has been released.
- **Beach Watch Web Site.** Now a year old, this web site hosts the first national listing of water quality conditions at beaches and other popular swimming locations (where that information is available). EPA will soon release a Beach Action Plan to help guide local, state, tribal, and federal efforts to improve beach monitoring and notification programs.

Next Steps

What's in store for the future? Because the Action Plan is a multiyear effort, several major actions are planned for each year through 2008. Listed here are several activities planned for 1999:

- **Watershed Restoration Action Strategies.** States and tribes will develop Watershed Restoration Action Strategies in 1999 to guide efforts in those watersheds identified by the states and tribes as most in need of restoration during 1999 and 2000. These Action Strategies will help target the efforts, programs, and financial resources of all levels of government in cooperation with other stakeholders, including agriculture, citizen watershed groups, businesses, and environmental interests.
- **Water Information Network.** In March the first version of the Water Information Network (WIN) was released to the public (www.epa.gov/win). WIN provides an Internet-based road map to watershed-specific information, real-time monitoring data, watershed stewardship opportunities, technical and financial assistance, laws and regulations, and more. Cooperating agencies and other stakeholders will continue this multiyear project to make a comprehensive set of information available to the public on the condition of each watershed in the United States.
- **Smart Growth.** The Interagency Work Group on Sustainable Communities will conclude efforts to develop federal policies to strengthen America's communities in conjunction with efforts to protect watersheds.
- **Address Pollution from Septic Systems.** EPA, in cooperation with other partners, will develop information on onsite sewage disposal technologies, performance standards, and innovative technologies and management solutions.
- **Identification of Essential Fish Habitat.** All 39 Fisheries Management Plans will be updated and approved in 1999, including the identification of habitat that is essential to fish and recommendations for conservation and enhancement measures.

[For more information on the Clean Water Action Plan, visit the Action Plan web site at www.cleanwater.gov/anniv/]

EPA Develops Strategy for Protecting Water Resources in Indian Country

In October of 1998, EPA's Office of Water released *Protecting Public Health and Water Resources in Indian Country: A Strategy for EPA/Tribal Partnership*. The strategy sets water program-specific objectives to ensure clean and safe water in Indian country. It is the first strategy developed by EPA's water program that focuses its efforts on Indian country. Among other goals, EPA hopes that by 2005 half of all federally recognized tribes will have approved nonpoint source assessment and management plans.

Currently only 3 percent of tribes have approved nonpoint source assessment and management programs, with an additional 4 to 5 percent just beginning work on their programs. The new Strategy calls for EPA to provide hands-on guidance and practical templates to help tribes develop or complete their nonpoint source assessment plans and to implement their management programs. The Agency is hosting several regional workshops to provide technical and programmatic assistance, as well as providing funding to tribes. EPA is also developing additional nonpoint source outreach materials targeted at American Indians.

In addition to nonpoint source control, the strategy will address other water-related issues, including wastewater treatment, water quality standards, safe drinking water, and more. Each issue will be addressed in four phases. First, the strategy hopes to establish a "water program environmental presence" in all federally recognized tribes, meaning individuals or groups in each tribe who can advise tribal governments on developing and implementing water programs.

Once a water program environmental presence is established, environmental problems need to be identified. EPA's water program and the tribes must identify and prioritize data collection needs. EPA hopes that by 2005, 40 percent of tribes will have water quality monitoring and assessment programs, as appropriate, and will be entering water quality data into EPA's national database.

Next, EPA and tribes will work together to establish tribal-specific water program priorities, identifying those projects to be implemented by tribes and those to be implemented by EPA. These priorities and roles are to be formalized in Tribal Environmental Agreements (TEAs) or similar types of agreements.

Once priorities have been established, EPA and tribes will implement programs to address specific water quality issues by 2005, using some of the following performance measures:

- Fifteen percent of tribes will have final water quality standards approved by EPA for waters under their jurisdiction. Currently, only 14 tribes (less than 5 percent) have approved water quality standards.
- Twenty percent of tribes that have EPA-approved water quality standards and have shown an interest in establishing a Total Maximum Daily Load (TMDL) program will have such a program in place or in the developmental stages. Currently, no tribes have TMDL programs.
- Fifty percent of Indian country will have approved nonpoint source assessment and management plans.
- The number of homes in Indian country with inadequate wastewater sanitation systems will be reduced by 25 percent.
- The population served by tribal community water systems providing drinking water that meets all existing health-based standards will increase from 86 percent to 95 percent.
- Forty percent of the population served by tribal community water systems will receive their water from systems with source water assessments in place, and where needed, source water protection programs in place.
- Twenty percent of tribes will have developed tribal conservation plans or alternate approaches for protecting wetlands and watersheds.

[For more information on the Strategy, contact Judy Hecht, U.S. EPA Office of Water, 401 M Street, SW, Washington, DC 20460. Phone: (202) 260-5682; e-mail: hecht.judy@epamail.epa.gov. You can read it online at www.epa.gov/ow/strategy.]

Tribal Environmental Success Stories

Many tribes have already been working hard to establish environmental programs on their lands. The following case studies are just a few examples of the kinds of successes the new tribal water strategy hopes to achieve for all federally recognized tribes.

■ **Campo Band of Kumeyaay Indians, California.** The Campo Indian Reservation is located in southeastern San Diego County. The Campo people are part of the Kumeyaay Indian Tribe, who have traditionally supported themselves through fishing and farming. Over the years, abuse and neglect have degraded the natural resources on the reservation. The Campo people have been diligently working to reverse the damage.

With assistance from the Indian Environmental General Assistance Program (GAP) through EPA, the Campo Band established the Campo Environmental Protection Agency (CEPA) to protect the health, safety, and environment of the reservation and surrounding community. Programs initiated by CEPA target the protection of the environment and the restoration of water resources. They include a section 106 Water Pollution Control Program, a section 104 Wetlands Protection Program, and a section 319 Nonpoint Source Control Program.

Land use and water resources planning on the reservation are guided by the cultural values of the Campo Band, specifically, the preservation and protection of natural resources. The tribe even used ancient tribal techniques to improve deteriorating ecosystems, placing natural rocks and brush in the channel of Diabold Creek to prevent undercutting by fast-flowing stormwater runoff. High rates of erosion along Campo Creek had resulted in severe siltation of the creek and its accompanying downstream irrigation/drinking water reservoir, silting in the reservoir. The tribe restored Campo Creek by planting native grasses and trees to stabilize the stream's eroding banks, which has also helped to increase the storage capacity of the underlying drinking water aquifer by reducing overland flow and increasing filtration. They also installed wire fencing to prevent livestock from grazing too close to the creek and destabilizing the streambank.

[For more information, contact Fidel Hyde, Campo EPA, 36190 Church Road, Suite 1, Campo, CA 90906. Phone: (619) 478-9369.]

■ **Gila River Indian Community, Arizona.** The Gila River Indian Community (GRIC) is located approximately 40 miles south of Phoenix, Arizona. It is the fourth most populous tribe in the United States with more than 20,000 members on more than 374,000 acres. Living adjacent to the rapidly growing Phoenix metropolitan area, GRIC is very interested in sustainable development that will protect the reservation's valuable natural resources.

Although more than 40 industrial and commercial facilities are located on the reservation, GRIC also has more than 40,000 acres of cropland for growing cotton, wheat, olives, pistachios, and other crops. In 1994 the community received a GAP grant to create a Department of Environmental Quality (DEQ) on the reservation to ensure the protection of the community's natural resources.

GRIC DEQ manages programs that provide technical and compliance assistance, take enforcement actions, and issue permits. It also monitors environmental indicators through a ground water monitoring network and surface water sampling. GRIC DEQ has also developed a mentoring program for those interested in environmental careers, and it provides leadership on voluntary risk reduction activities through an agricultural BMP working group.

[For more information, contact Pat Mariella, Gila River Indian Community, Department of Environmental Quality, P.O. Box 97, Sacaton, AZ 85247. Phone: (520) 562-2234.]

■ **Hoopa Valley Tribe, California.** Hoopa Valley, California's largest Indian reservation, was home to many lumber mills in the 1950s and 1960s. The clearcutting of vast areas has resulted in many water quality problems on the reservation. Landslide-prone areas were logged and roads were constructed within stream riparian zones, severely impacting the salmon and steelhead fisheries and the reservation's overall water quality.

Tribal Environmental and Natural Resource Assistance Handbook

The Tribal Environmental and Natural Resource Assistance Handbook, released in March 1999, was developed by the Domestic Policy Council Working Group on American Indians and Alaska Natives. This handbook is a compilation of the federal sources of financial and/or technical assistance programs available for tribal environmental management. It is intended to benefit tribal environmental staff and to inform federal, regional, state, and local government employees about the sources of environmental assistance available to improve customer service to the tribes. Sources of assistance span various environmental categories, including air, water, plants and animals, toxics/hazardous waste, solid waste, pollution prevention, emergency preparedness and response, and environmental education. The document can be downloaded from the Internet at www.epa.gov/indian/tribhand.htm.

In 1981 the Hoopa Valley Tribe became the first tribe to establish an environmental agency. Hoopa's Tribal Environmental Protection Agency (TEPA) administers several environmental programs, which initially addressed air quality, lead-based paint, water pollution control (sections 106 and 319), hazardous waste management, and solid waste management. TEPA received a GAP grant in 1994 to expand its program to cover emergency preparedness, underground storage tank management, wetlands protection, and monitoring and assessment. The tribe also received a section 319 grant to implement BMPs, remove contaminated soils, and monitor the Supply Creek and Trinity River.

The tribe is currently developing standards for sediment TMDLs in the Supply Creek watershed. TEPA is also planning to conduct a dewatering operation to divert nonpoint source water pollution from an open and highly permeable landfill site. In June 1998, the Hoopa Valley Tribe signed a Performance Partnership Agreement with EPA Region 9 (the second tribe to do so). The agreement enables the tribe to streamline administrative grant processes and to combine GAP activities with other EPA program grants to expedite implementation of multimedia activities.

[For more information, contact Bob Ulibarri, Senior Environmental Planner, P.O. Box 1348, Hoopa, CA 95546. Phone: (530) 625-5515.]

Nine Salmon Listed in Urban Pacific Northwest

The National Marine Fisheries Service has added nine species of salmon and steelhead in Washington and Oregon, including metropolitan Portland and Seattle, to the endangered species list. This action marks the first time federal protection has been extended to salmon found in streams in heavily populated areas of the Pacific Northwest.

The March 1999 endangered species listings are the result of such factors as land use and water development projects that degrade watershed and stream conditions critical to salmon survival, habitat loss, over harvesting, dam construction and operation, and certain hatchery practices.

“Our goal here is to restore salmon,” said Department of Commerce Secretary William M. Daley. “But we know that we cannot accomplish that alone. As we have all said repeatedly, extinction is not an option. We want to work together with state and local officials to preserve for future generations healthy salmon stocks along with clean and productive rivers and streams.”

For scientific purposes, the salmon populations are classified as evolutionary significant units, or ESUs, rather than as species. The listed ESUs range from the sockeye salmon in Washington’s rugged Olympic Peninsula to the chinook salmon, the largest of any salmon, found in the heavily urbanized area of Puget Sound.

At this time, no immediate regulations will apply to state and private activities in the areas where species are listed as threatened. The Fisheries Service will work closely with its partners to develop tailor-made regulations that include state and local conservation initiatives. The Fisheries Service has said that the listing decisions will go into effect in May.

Salmon Populations Added to Endangered Species List

- ✓ Puget Sound chinook (threatened)
- ✓ Lower Columbia River chinook (threatened)
- ✓ Upper Columbia River spring-run chinook (endangered)
- ✓ Upper Willamette River chinook (threatened)
- ✓ Hood Canal summer run chum (threatened)
- ✓ Columbia River chum (threatened)
- ✓ Upper Willamette River steelhead (threatened)
- ✓ Middle Columbia River steelhead (threatened)
- ✓ Ozette Lake sockeye (threatened)

The agency is deferring for six months its decision on four remaining chinook salmon ESUs — Snake River fall run, southern Oregon and California coastal, California Central Valley fall run, and California Central Valley spring run. The Fisheries Service will use the six month extension to resolve areas of scientific disagreement about the ESUs. A final determination will be made in September. President Clinton’s FY2000 budget proposal asks Congress for \$100 million to help local and tribal efforts to protect West Coast and Alaska salmon. Three western states already have projects underway.

Under the Endangered Species Act, a species likely to become extinct is categorized as endangered. A species likely to become endangered within the foreseeable future is categorized as threatened.

[For more information, visit the National Marine Fisheries Service’s Northwest Region web site at www.nwr.noaa.gov.]

News from the States, Tribes, and Localities

Fight for Lake Winnebago Continues



Lake Winnebago in Fond Du Lac County, Wisconsin, is nationally known as a sportfisherman’s heaven. Several large sportfishing tournaments are held on the lake each year, including the Masters Walleye Tournament and the Mercury Marine National Tournament. But perhaps the largest tournament the lake has had to face, and continues to face, is its daily battle against nutrient overenrichment and sedimentation. With a new sediment control basin and grassed waterway, the citizens of Fond du Lac County hope to turn the odds in favor of clean water.

Lake Winnebago is located between the Upper and Lower Fox Rivers and is the largest inland lake in Wisconsin. Most of the land in the watershed has been highly developed for uses such as paper mills and power plants. The remainder of the drainage basin is agricultural land.

For years Lake Winnebago has suffered from summer algae blooms, sometimes so bad that they covered the entire lake, creating foul-smelling mats of rotting algae. As the algae rotted, they depleted the oxygen in the water, impacting fish and other aquatic organisms. Excessive sediments pouring into the lake from agricultural runoff cloud the water and make it difficult for sunlight to reach submerged vegetation. In 1990 citizens in Fond Du Lac County decided that they had had enough. They needed to take immediate steps to win the war against nutrient enrichment and sedimentation in the lake if they wanted the lake to continue to be a highly valued sportfishing

and recreation site bringing in thousands of dollars a year in revenue. They organized the Lake Winnebago East Priority Watershed Project (LWEPWP).

Over the last few years, LWEPWP has worked with area farmers, encouraging them to install manure storage facilities to reduce runoff, fence cows from streams and restore streambanks, and increase crop residue management (formally called conservation tillage) and contour farming. But the most notable achievement of the LWEPWP is a sediment reduction project completed this past September along a tributary that runs into Lake Winnebago. Using an \$8,300 grant from the FishAmerica Foundation, a national organization that provides support for groups working to improve fish populations or water quality, the Fond Du Lac County Land Conservation Department built a water and sediment control basin and a grassed waterway on two private lots.

The Partners

Several organizations came together to help get the project off the ground. The Wisconsin Department of Natural Resources (WDNR) was involved from the start. A WDNR biologist wrote a letter of endorsement to the FishAmerica Foundation asking for the grant. A WDNR water management specialist issued the necessary permits for the project.

WDNR also started a volunteer monitoring program to help monitor the lakes' progress. These "Self-Help Lake Monitors" monitor for water clarity (with a Secchi disk); take readings for temperature, phosphorus, and chlorophyll; and monitor aquatic plant growth. The monitors submit their data to WDNR.

The Wisconsin Department of Trade and Consumer Protection worked closely with the Fond du Lac County Land Conservation Department to choose the site and design of the project. The Wisconsin Conservation Corps, composed of unemployed youth from 18 to 25 years old, cleared brush from the project site.

High Hopes for the Future

Although it is too soon to report the benefits brought to the lake by the sediment control basin and grassed waterway, the Land Conservation Department estimates that together they will control agricultural runoff from 286 acres and prevent 320 tons of sediment from entering the lake each year.

[For more information, contact Coleen Lapham, Fond du Lac County Land Conservation Department, Agricultural Service Center, W6529 Forest Avenue, Fond du Lac, WI 54937. Phone: (920) 923-5562; e-mail: clapham@fdldotnet.com.]

Georgia City Pioneers Stormwater Utility Fee



EDITOR'S NOTE: Based on a paper presented by Brant D. Keller, City of Griffin, Director of Public Works and Stormwater Department, and published in the *Proceedings of the 1999 Georgia Water Resources Conference*.

The city of Griffin is the first municipality in Georgia to establish a stormwater utility to fund its nonpoint source and floodwater control activities. The process was prompted by the desire to take a proactive approach to the impending NPDES Phase II regulations, which will be issued in October of this year and will require approximately 3,500 U.S. cities with populations less than 100,000 to obtain permits for their stormwater discharges.

Several years ago, when the concept of a stormwater utility was conceived, 150-year old Griffin's stormwater infrastructure, like that of many older cities, was sorely in need of renovation, but few funds were available to address the city's nonpoint source and flooding problems. Such problems ranged from illicit discharges of automotive fluids into the city's storm sewers to a neighborhood where the homes suffered repeated flooding.

The process of getting the utility established took 18 months and cost a quarter of a million dollars. But the carefully crafted program is paying off — officials expect the utility to generate \$1.2 million per year. The money will fund two additional work crews, an environmental science team, the establishment of a capital construction program, and the development of a GIS database containing an inventory of the city's 10,000-structure drainage system.

The utility is based on a user fee of \$2.95 per month per residence or, for nonresidential landowners, per 2,200-square-foot “equivalent runoff unit” (ERU). Griffin, with a population of 24,000, has an estimated 33,685 ERUs. Schools get a 50 percent credit on their stormwater utility bill for teaching the “WaterWise” water conservation curriculum in kindergarten through 12th grade. An additional 50 percent is credited against their wastewater/water bill to emphasize the interrelationship of stormwater, surface water, and ground water.

According to Griffin’s Director of Public Works and Stormwater, Brant Keller, establishing the utility involved five phases.

1. *Preparation* involved characterizing the city’s needs, which were found to be flood control, failed infrastructure, erosion and sediment control, and lack of funding and programs to address water quality issues.
2. *Concept development* consisted of evaluating the various alternatives and selecting the most appropriate ones.
3. *Detailed analysis* focused on policy development and deciding who gets billed, how often the bill is sent out, and the level of service. Secondary funding methods such as money from the general fund, revenue bond sales, grants, and loans were explored.
4. *Data systems and implementation* set up accounts and integrated the stormwater utility fee into the billing system for the water, wastewater, solid waste, electricity, and gas services the city already provided.
5. *Public information and education* included distributing brochures, holding public meetings, and filming a 6-minute video that aired on television and at meetings of civic groups across the city.

“A significant amount of public information and education was done early to inform the general public and keep the commission informed. This allowed for feedback to develop our strategy for the program. Public information and education will be important throughout the life of the utility,” explained Keller. “Keeping the general public in the loop can only enhance water quality and conservation.”

Study Shows State NPS Enforcement Capabilities

The Environmental Law Institute (ELI) has released a report that identifies areas where states have established regulations that can be used for nonpoint source control. The report, *Almanac of Enforceable State Laws to Control Nonpoint Source Water Pollution*, identifies existing laws that states can use to prohibit nonpoint source pollution. The three main types of laws recognized in the report are water pollution control laws, other discharge limitations, and fish and fisheries laws. EPA funded the ELI study with hopes of encouraging states to use the resources currently available to them. Although most states do not have laws that specifically address nonpoint source pollution, the report notes that other laws can be used for that purpose.

[For more information, contact the Environmental Law Institute, 1616 P Street, NW, Suite 200, Washington, DC 20036. Phone: (202) 939-3800; fax: (202) 939-3868; e-mail: law@eli.org; web site: www.eli.org.]

According to Keller, the city took a number of other actions that propelled the program toward success. Key city officials were included in the process from the beginning and made aware of the challenges facing Griffin in stormwater management. The services of a knowledgeable and experienced consultant eased the entire project, and an open attitude toward the public was the rule. The message was realistic — that the utility was a necessary part of an overall approach to stormwater management, not a magic wand to solve all problems. Keller, who came to city government from a sales background, credits a “solid sales strategy” with pushing the utility through “tough times and good.”

The utility also brought in some additional funding sources. In November 1996, voters approved a special-purpose sales tax with a portion going toward stormwater system improvements. In addition, the utility helped the state pay back loans from the state revolving loan fund and provided a match for grants from the Georgia Emergency Management Agency and EPA’s section 319 program.

[For more information, contact Brant D. Keller, Director, Public Works and Stormwater Department, P.O. Box T, Griffin, Georgia 30224. Phone: (770) 229-6603; fax: (770) 229-6613; e-mail: bkeller@griffinpower.org.]

Technical Notes

Data Are the Foundation for Watershed Protection

by Steve Dressing, Environmental Consultant

Data Needs for Watershed Projects



Successful watershed planning and management are highly dependent upon a willing, knowledgeable, and skilled collection of people interested in watershed health. But to transform interest into action, people need good information regarding watershed condition, the effectiveness of various solutions, and the time frame over which measurable results are likely to appear.

To assess watershed condition and determine the causes of impairments, watershed practitioners need data regarding the chemical, physical, and biological condition of the water bodies; climate; and landform, land use, and land management. In addition, to project the potential benefits of implementing restoration or pollution control practices, analysts need information regarding the effectiveness of these measures. Data needs vary with the situation, however, and should be based upon clear analytic goals and data quality objectives. As the Total Maximum Daily Load (TMDL) Coordinator for Washington State's Department of Ecology, Steve Butkus has found that "Analysis of a TMDL is sometimes held up because people want too much data, too much certainty. This often results in delayed implementation, higher costs, and decisions that are not really better."

Data are of little value unless they are collected with known accuracy and precision and stored and manipulated under a well-designed data management system. Planning for the management of watershed data before monitoring begins will help answer key questions that affect watershed management decisions. Continued advances in data management, analysis, and presentation capabilities are making it easy for watershed practitioners to have inexpensive access to data sources, data management software, data presentation software, and statistical analysis packages. Following is an overview of several data systems that continue to play an integral part in the assessment and management of nonpoint source pollution.

STORET

For 30 years EPA's STORage and RETrieval (STORET) system has served as the primary source of ambient chemical and biological water quality data. According to David Chestnut, a senior scientist with the South Carolina Department of Health and Environmental Control (SCDHEC), "STORET is the only national water quality database that allows both data entry and retrieval by federal, state, and other partners." This aspect of the system allows for STORET to be used by diverse users for many different types of programs and projects.

Because of emerging data and information needs associated with watershed protection in 1991, EPA began to develop a new, modernized system. The new STORET will serve as EPA's principal repository for marine, freshwater, and biological monitoring data. STORET version 1.1 was released in March 1999. Designed for local workstations with Windows 95/98/NT and access to Oracle, version 1.1 also provides the capability to upload directly to EPA's Central STORET Data Warehouse. The new STORET system has menu access and browse capability, supports storage of quality assurance and control information, provides a wide range of standard output formats, and supports geographic information system (GIS) applications.

While development is not yet complete, Chestnut believes that the new STORET will "make things a lot easier for managers and modelers to combine data on particular contaminants from STORET with other existing data, like rainfall and flow, to better examine their relationships and help solve nonpoint source problems."

New data and changes to existing data in the original STORET system will be prohibited after March 27, 1999, but users will be able to retrieve old data from the original STORET until retrieval capabilities are made available through the new Legacy Data Center (LDC). The LDC is

an Oracle-based database that will hold STORET data collected through 1998, with the exception that old data meeting specified quality assurance and control requirements will be transferred to the new STORET. EPA will move all old data to the LDC by the end of June 1999.

[Free copies of the installation CD for STORET version 1.1 can be requested by calling (800) 424-9067 or by sending an e-mail to STORET@epa.gov.]

NonPoint Source Management System

EPA developed the NonPoint Source Management System (NPSMS) software for use by the 22 watershed projects within the 18 states participating in the National Monitoring Program (NMP), which is supported through a combination of EPA nonpoint source program funds and other state, local, and federal funds. The NMP is a collaborative effort to evaluate the benefits of implementing nonpoint source controls at the watershed level through rigorous and consistent collection of chemical, physical, and biological water quality data; weather data; and land use and land management data. NPSMS was designed to ensure standardized reporting of these data to facilitate comparisons between projects and to develop a national database supportive of program-wide evaluation. Past watershed programs such as the Model Implementation Program and Rural Clean Water Program did not have standardized water quality reporting requirements, making program evaluations difficult.

All NMP projects have data management and reporting plans that include use of STORET for entry and analysis of raw data (e.g., individual pH values), and use of NPSMS for data already analyzed to some degree (e.g., the number of pH measurements that fall between 6.0 and 6.5). NPSMS also supports information regarding project objectives, funding, monitoring designs, land use, and remedial and preventive control measures. EPA designed NPSMS for future linkage to STORET, and NPSMS data can be output for use with software such as SAS (Statistical Analysis Software).

[Copies of NPSMS software can be obtained by contacting Thomas Davenport, U.S. EPA Region 5, 77 West Jackson Street (W-15J), Chicago, IL 60604. Phone: (312) 886-0209; fax: (312) 886-7804; e-mail: davenport.thomas@epa.gov.]

BASINS

Many states, with help from EPA, are currently developing Total Maximum Daily Loads (TMDLs). A TMDL is a written, quantitative assessment of water quality problems and contributing pollutant sources. It specifies the maximum pollutant loading that allows a water body to meet water quality standards, allocates pollutant load reductions among pollutant sources in a watershed, and provides the basis for taking actions needed to restore a waterbody. It can identify the need for point source and nonpoint source controls.

TMDL development depends upon good data, data management, and data analysis and interpretation. According to Washington State's Steve Butkus, "A lack of data causes analysts to make too many judgments regarding how a system works, resulting in greater modeling uncertainty, and greater margins of safety in nonpoint source TMDLs. TMDLs with greater margins of safety are more demanding and may not be feasible." For example, failure to obtain sufficient data to precisely quantify the relationship between rainfall and runoff will result in large uncertainties in estimating pollutant loads generated from the specific storm size (e.g., 25-year, 24-hour storm) for which nonpoint source control measures are designed. To ensure that load limits are not exceeded, the controls will need to be designed to treat larger runoff volumes than would be needed under conditions of less uncertainty, thus driving up the cost of pollution control.

A tool of choice in the development of TMDLs is EPA's Better Assessment Science Integrating Point and Nonpoint Sources (BASINS), which integrates GIS, national watershed data, and state-of-the-art environmental assessment and modeling tools into one package. BASINS can support the analysis of a variety of pollutants at multiple scales, using tools that range from simple to sophisticated. The heart of BASINS is its combination of five groups of components:

- National databases
- Assessment tools for evaluating water quality and point source loadings at a variety of scales

- Utilities, including local data import, land-use reclassification, watershed delineation, and management of water quality observation data
- Watershed and water quality models
- Postprocessing output tools for interpreting model results.

Bringing watershed data to life with modern data management and analysis tools such as BASINS closes the loop between the people who bear the costs of managing watersheds and the data that tell the story about the problems and solutions for the watershed. Decisionmakers who act without the benefit of properly analyzed and clearly presented data to guide them are very likely to make poor choices. Given the availability of low-cost solutions to data management needs, those involved in watershed activities are now in the best position ever to use good information to take good, cost-effective actions to restore and protect their treasured resources. For more information on BASINS, contact Paul Cocca, U.S. EPA, Office of Science and Technology, Mailcode - 4305, 401 M Street, SW, Washington, DC 20460. Phone: (202) 260-8614; fax: (202) 260-9830; e-mail: cocca.paul@epa.gov.

[For more information on data needs for watershed protection, contact Steve Dressing, 1799 Rampart Drive, Alexandria, VA 22308. Phone: (703) 360-6054.]

South Platte River a Source of Atmospheric Nitrogen



In a surprising turn of the environmental tables, research conducted by two USGS scientists may indicate that rivers carrying heavy loads of nitrogen pose a threat to air quality. P.B. McMahon and K.F. Dennehy measured nitrous oxide emissions from the South Platte River in Colorado from 1994 to 1995. Based on their measurements, they estimate that the river emits an annual volume of the pollutant that rivals that from all the primary wastewater treatment plants in the United States.

Nitrous oxide in the atmosphere contributes to both the greenhouse effect and destruction of the ozone layer. The main activities producing nitrous oxide in the United States in 1998 were fossil fuel combustion, agricultural soil management, and the production of adipic acid (used in the manufacture of nylon) and nitric acid.

The researchers did not set out to look for air quality impacts. "We were more interested in studying denitrification in river sediments as a way of removing nitrate from river water. But once we realized the level of denitrification that was occurring, we wondered how much nitrous oxide was in the river and how much was emitted to the atmosphere," says McMahon.

McMahon and Dennehy set up nine sampling stations in the river, beginning just upstream of Denver in an agricultural/forested area and following the river's course 733 km downstream past Denver's largest wastewater treatment plant and through irrigated cropland. Downstream of the plant, more than 90 percent of the river's volume during low flow can consist of wastewater effluent high in ammonium and nitrate. And from July through September — irrigation season — nitrate-rich ground water seeping from beneath the neighboring cornfields makes up a considerable portion of the river's flow. Together, these two nitrogen sources can raise the river's level of inorganic nitrogen from 0.1 to 11 mg/L.

Using containers suspended above the river with openings beneath the surface to collect air samples directly above the water, the researchers found a positive relationship between nitrogen levels in the water and nitrous oxide emission rates to the air. Their measurements showed that the South Platte's water was supersaturated with nitrous oxide by up to 2,500 percent, forcing the gas into the atmosphere.

The researchers discovered that a single square meter of the river's surface emitted from 90 to 32,000 micrograms of nitrogen per square meter per day. Municipal wastewater treatment plants, by comparison, may release between 6,400 and 1 million micrograms of nitrous oxide per square meter per day. McMahon and Dennehy calculated that the total annual emission from the South Platte ranges from 2 trillion to 6 trillion micrograms of nitrogen per year — as much as the total annual emissions from all primary wastewater treatment plants in the country.

The study's findings could have serious implications. "It is likely," the researchers write, "that nitrogen-enriched rivers are at least as important as wastewater treatment processes as anthropogenic sources of nitrous oxide to the atmosphere." But, McMahon says, "One of the limitations of extrapolating globally is that so little work has been done on this. The South Platte River may well be an anomaly." McMahon reports that the team will also do research on the Arkansas River, which has a watershed with similar land uses.

[For more information, contact Peter B. McMahon, U.S. Geological Survey, Denver Federal Center, Mail Stop 415, Denver, CO 80225. e-mail: pmcmahon@usgs.gov.]

Notes on Education

Range and Natural Resource Camp Encourages Good Stewardship



The California Section of the Society for Range Management sponsors a one-week Range and Natural Resources Camp each year in California for about 25 youths aged 15 to 18.

Range Camp is designed to introduce young men and women to the extent, importance, and value of California's rangeland resources. It encourages leadership and good stewardship through interaction with recognized professionals in both classroom and field sessions. Ecology and practical land management skills are emphasized, including plant identification, livestock management, and wildlife and range analysis and improvement. Students participate in hands-on projects and demonstrations both in the classroom and in the field. Some of the projects include assessing macroinvertebrates in local streams, touring a local working ranch, and collecting local plants for identification.

Students are required to take a plant identification test and an overall exam on the week's sessions. The "Top Camper" is then sponsored to attend the national resources camp. The next national camp will be held in Boise, Idaho, in February 2000.

[For more information about this year's camp in California, contact Cynthia Mallett, Resource Conservation District of San Diego County, 332 Juniper Street, Suite 110, Escondido, CA 92025. Phone: (760) 745-2061.]

Illinois Students Begin 30-Year Highway Study



High school advanced placement (AP) classes are meant to prepare students for success in college. They are designed to help students acquire the attitudes, skills, and knowledge expected of a college student. But students in the AP environmental science (APES) and AP math classes, as well as the special education classes, at Mundelein High School in Lake County, Illinois, are pushing the envelope a little farther. The students have started a 30-year highway study that will not only prepare them for college, but also will help them learn the value of environmental data collection and analysis.

The study is focusing on the proposed new Route 53 Tollway. (Final approval for the project may take one to two years.) The tollway is set for construction in 2002 by the Illinois Department of Transportation (IDOT). Currently, Route 53, a multilane divided freeway on the northwestern side of Chicago, turns back into a two-lane road at the border of Cook County and Lake County. According to the Director of Technology at Mundelein High School, Linroy Kilgore, "Lake County is undergoing tremendous growth, both in population and building projects, due to our proximity to Chicago." This rapid growth has resulted in enormous rush hour traffic problems. IDOT proposes to expand Route 53 into the middle of Lake County, right past Mundelein, to relieve traffic congestion. The new road would pass through farmland and other undeveloped lands. The students at Mundelein hope to find out what effects rapid urbanization, including new highway projects like this one, have on the environmental conditions of the surrounding area.

The students will collect data from runoff in drainage areas, lakes, and ponds along a five-mile stretch of the proposed route to show environmental conditions in the area before, during, and after construction of the new highway. Data on pH, alkalinity, salinity, soil content, oxides (sulfur and nitrogen), particulates, water quality, and aquatic life will be collected. The project also involves noise and air studies, including the use of aerial reconnaissance and photography. The

students will learn to analyze the data they collect and make conclusions and predictions from those analyses.

The project officially began in September 1998 with planning and equipment acquisition, and the APES students began on-the-ground project activities in January 1999. So far, they have collected many samples, most during a massive data collection effort on Earth Day. Each classroom involved in the project will have access to laptop computers, mobile testing kits that include computer-based sensing equipment, digital projectors, and scan converters that allow digital computer signals to be viewed on a normal TV screen to present the project's findings to other students and the community.

Garnering Support and Spreading the Word

The citizens of Mundelein will play a major role in the success of the tollway project. All of the local businesses that are part of the school's Ventures in Partnerships program (a program centered around a voluntary agreement between local businesses and Mundelein High to help provide such things as career days) have pledged their support for the project. Those businesses include Motorola, Grand National Bank, and many others. Peter Luzenger, Superintendent of Grounds at Ivanhoe Golf Course, will bring a unique commercial perspective to the project. Luzenger was chosen as last year's "Illinois Environmentalist of the Year" for the environmental protection measures he has implemented on his golf course, which will receive runoff from the proposed tollway. The tollway project will supply Luzenger with a wide range of environmental data that will help him improve the environmental conditions of the golf course in the future.

The students will endeavor to keep the public informed of the project's progress through coverage in the local papers, mailings to parents, and student presentations to community groups and parents. The students will also set up a display explaining the project in the town's public library. They are developing their own web site to harbor all the data collected each year. The web site (www.impact53.org/) is expected to be online by May. The school's existing web sites (www.mundelein.lake.k12.il.us or www.mhslake.net) will be used to publish data in the interim.

Grant Gets Tollway Project on the Road

The project has been made possible with the help of a Technology Literacy Challenge Fund Grant (TLCF). Through a program funded by the U.S. Department of Education, the Illinois State Board of Education provides TLCF grants to school districts and other partners for hi-tech projects. The Board of Education approved nearly \$18 million in grants for FY 1999. Applicants must develop three- to five-year plans addressing the technology to be acquired, how that technology will be integrated into the curriculum, methods that will be used to maximize the use of technology, professional development to be offered to teachers, and existing sources of funding.

Full Circle

Each year the project will involve approximately 150 students. Kilgore estimates that over the 30-year life span of the project approximately 8,000 students will have worked on some aspect of it. "Some of those students will grow up, marry, and have children who will work on the very same project," predicts Kilgore. "The project and the resulting data and analysis will be the most authentic activity any student could ever aspire to accomplish," he added.

[For more information, contact Linroy Kilgore, Mundelein High School, 1350 West Hawley Street, Mundelein, IL 60060. Phone: (847) 949-2200, ext. 300; fax: (847) 949-0079; e-mail: kilgore@linroykilgore.org.]

Reviews and Announcements

EPA Region 5 Publishes

Source Book on Natural Landscaping for Public Officials

Natural landscaping, the *Source Book* says, is "an aesthetically exciting, ever-changing tapestry of hardy, primarily native plantings well adapted to the local climate and soil." It minimizes the



environmental impacts of pesticides and fertilizers and the air-polluting emissions from lawn-maintenance equipment. In recent years, it's been gaining enthusiastic acceptance across the county.

The *Source Book* explains the basic principles and benefits of natural landscaping, demonstrates the feasibility of using natural landscaping successfully in the greater northeastern Illinois region, and tells how local officials can encourage the use of natural landscaping. It also identifies ways to avoid pitfalls that could result in poorly implemented landscaping, describes tools and techniques, and provides direction to other information sources. Although much of the information is related specifically to the Midwest, the basic principles and benefits described in the *Source Book* should apply anywhere.

[The manual is available online at www.epa.gov/glnpo/greenacres/toolkit/index.html. It can also be ordered from U.S. EPA Region 5, 77 West Jackson Boulevard, AE-17J, Chicago, IL 60604. Phone: (312) 353-2000.]

EPA Releases New Inventory of Watershed Training Courses



Are you interested in taking a watershed-related training course in 1999? If so, you'll want to look at EPA's recently published *Inventory of Watershed Training Courses*. This inventory provides one-page summaries of 180 watershed-related training courses sponsored by federal and state agencies, as well as the private sector. The course summaries provide you with enough information to determine your level of interest and contacts for further information, much like a college catalogue. The *Inventory* was developed in response to a key action item in the *Clean Water Action Plan*: "In 1998, federal agencies will complete an inventory of watershed training programs. Relevant offerings will be promoted through the Watershed Academy and through other means as appropriate." The *Inventory* was developed with the assistance and support of several interagency training work groups, an EPA training work group, the private sector, and others.

[Copies of the *Inventory of Watershed Training Courses* are available at no charge from NCEPI at 800-490-9198. (Please include the document number, EPA 841-D-98-001, in your request). The *Inventory* is also available on EPA's Watershed Academy web site at www.epa.gov/OWOW/watershed/wacademy/catalog.html.]

60 Ways Farmers Can Protect Surface Water



This publication is a comprehensive and practical guide on farming and water quality. It contains information on how farmers can protect surface water while cutting unnecessary costs and increasing yield. Case studies of farmers throughout the Midwest who are successfully implementing the practices are provided. The publication, developed using section 319 funding, covers a wide range of topics, including controlling runoff, managing crop residue, and effectively using pesticides and herbicides with minimal impact on the environment. More than 200 photos and illustrations demonstrate water-friendly practices.

[The publication is available for \$10 from the University of Illinois, ITCS, 1401 South Maryland Drive, Urbana, IL 61801. To order by phone, call (800) 345-6087. Specify document number NCR589. You can also order online at www.ag.uiuc.edu/~vista/catalog/professional/index.html.]

1998-99 River and Watershed Conservation Directory Published

Developed through a cooperative agreement between River Network and the National Park Service's Rivers, Trails and Conservation Assistance Program, the directory will serve as a valuable tool to aid existing and future river and watershed groups in the protection of one of our most valuable resources — rivers and their watersheds. An expansion and update of the 1996-97 *River and Conservation Directory*, it contains more than 3,000 names, addresses, and phone numbers of contacts for those interested in volunteering in or initiating river/watershed conservation work. The directory is arranged by state, with federal agencies and national organizations listed in the front.

[For more information or to obtain a copy, contact River Network, P.O. Box 8787, Portland, OR 97207. Phone: (503) 241-3506, or National Park Service, RTCA, 1849 C Street, NW, Room 3606, Washington, DC 20240. Phone: (202) 565-1200.]

NRCS Simple Stream Assessment Guide



The USDA Natural Resources Conservation Service's new *Stream Visual Assessment Protocol* (SVAP) is designed for landowners and NRCS field personnel. It uses visual characteristics and a simple scoring system to identify problems and provide a general overall assessment. The guide incorporates educational material so users can gain a basic understanding of stream ecology and the importance of restoring stream/riparian systems.

The SVAP is designed as a basic assessment guide for nonscientists. The guide is not intended to replace a biological survey or habitat inventory; its primary value is to help landowners understand the value of healthy streams and to serve as a tool for identifying problems the landowner can correct. It might also be useful for volunteer groups and watershed coalitions.

Although usable as published, the protocol can be tailored to specific regions. A modification process based on a stream classification system and least-impacted reference sites is explained in the document. The 36-page document is available through the Internet at www.ncg.nrcs.usda.gov/tech_notes.html.

[For more information, contact Bruce Newton, National Water and Climate Center, USDA Natural Resources Conservation Service, 101 Southwest Main Street, Suite 1600, Portland, OR 97204. Phone: (503) 414-3055; fax: (503) 414-3101.]

Datebook

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

Meetings and Events

May 1999: American Wetlands Month

- 2-4 *Governor's Conference on Greenways and Trails*, Roanoke, VA. Contact conference Registrar, Division of Continuing Education, 810 University City Boulevard, Suite D, Mail Code 0272, Virginia Tech, Blacksburg, VA 24061. Phone: (540) 231-3306.
- 2-5 *National Town Meeting For A Sustainable America*, Detroit, MI. Sponsored by the President's Council on Sustainable Development. For more information, explore the NTM web site at www.sustainableamerica.org/about/default.cfm or call (888) 333-6878.
- 10-14 *WEFTEC Latin America '99*, Rio de Janeiro. Contact the Water Environment Federation at (800) 666-0206; fax: (703) 684-2492; e-mail: confinfo@wef.org.
- 12-14 *Municipal Storm Water Management*, Cincinnati, OH. Contact Jane S. Herbstreit, American Society for civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400. Phone: (703) 295-6007; fax: (703) 295-6144; e-mail: jherbstreit@asce.org.
- 16-19 *Sixth National Watershed Conference*, Austin, TX. Contact John Peterson, Executive Director, National Watershed Coalition, 9304 Lundy Court, Burke, VA 22015-3431. Phone: (703) 455-6886; fax: (703) 455-6888; e-mail: jwpeterson@erols.com.
- 16-21 *International Conference on Diffuse Pollution*, Perth, Western Australia. Contact Dianne McLeod, Conference Secretariat, P.O. Box 257, South Perth, WA 6951. Phone: 61-8-9450-1662; fax: 61-8-9450-2942; e-mail: convlink@wantree.com.au; web site: www.environment.wa.gov.au.
- 17-20 *Aquatic Weed Control, Aquatic Plant Culture, and Revegetation Short Course*, Fort Lauderdale, FL. Contact Beth Miller-Tipton, Director, University of Florida, Office of Conferences and Institutes, Building 639 Mowry Road, P.O. Box 110750, Gainesville, FL. Phone: (352) 392-5930; fax: (352) 392-9734; e-mail: conf@gnv.ifas.ufl.edu.
- 17-20 *National EPA State, Tribal, and Local Wetlands Program Symposium*, Boulder, CO. Contact the Conservation Tech. Info. Center, 1220 Potter Drive, Room 170, W. Lafayette, TN 47906. Phone: (765) 494-9555; fax: 765-494-5969; e-mail: ctic@ctic.purdue.edu; web site: www.epa.gov/OWOW/wetlands.

May (continued)

- 23-28 *10th International Soil Conservation Organization Conference, West Lafayette, IN. Sustaining the Global Farm: Local Action for Land Stewardship.* Contact ISCO99, Purdue University, 1196 Soil Building, West Lafayette, Indiana 47907-1196. Phone: (765) 494-8683; fax: (765) 494-5948; e-mail: isco99@ecn.purdue.edu; web: 81SOecn.purdue.edu/-isco99.
- 25-27 *Water Quality Enhancement Techniques for Reservoirs and Tailwaters Workshop, Cincinnati, OH.* Laurin Yates, Civil Engineering Technician, Coastal and Hydraulics Laboratory. Phone: (601) 634-3792; fax: (601) 634-4158; laurin.i.yates@wes01.usace.army.mil.

June 1999

- 6-9 *26th Annual Water Resources Planning and Management Conference: Preparing for the 21st Century, Tempe, AZ.* Contact ASCE Conferences, 1801 Alexander Bell Drive, Reston, VA 20191-4400. Phone: (800) 548-2723 or (703) 295-6300; fax: (703) 295-6144; e-mail: conf@asce.org; web site: waterqq.asce.org.
- 9-12 *The Third National Workshop on Constructed Wetland/BMPs for Nutrient Reduction and Coastal Water Protection.* New Orleans, LA. Contact Frank Humenik, North Carolina State University, Box 7927, Raleigh, NC 27695-7927. Phone: (919) 5151-6767; fax: (919) 513-1023; e-mail: frank_humenik@ncsu.edu; www.cals.ncsu.edu/waste_mgt/workshop.html.
- 9-11 *The Third Annual Statewide Pollution Prevention Conference, Jacksonville, FL.* Contact Dawn Jenkins, University of Florida TREEO Center, 3900 SW 63rd Blvd., Gainesville, FL 32608-3800. Phone: (352) 392-9570; fax: (352) 392-6910; e-mail: djenkin@treeo.doce.flu.edu.
- 16-18 *Virginia's Sustainable Future, Richmond, VA.* To register, call (804) 360-1500; e-mail: malloymsm@aol.com; web site: www.deq.state.va.us.
- 23-26 *Groundwater University, Long Pine, NE.* Contact Wendy Conrad, Groundwater University Director, P.O. Box 22558, Lincoln, NE 68542. Phone: (800) 858-4844; e-mail: wendy@groundwater.org.

July 1999

- 13-15 *Second National Mitigation Banking Conference, Atlanta, GA.* Contact Terrenne Institute, 4 Herbert Street, Alexandria, VA 22035. Phone: (703) 548-5473.
- 24-30 *Coastal Zone '99, San Diego, CA.* Contact: Madeleine Walsh, Urban Harbors Institute, University of Massachusetts, Boston 100 Morrissey Blvd., Boston, MA 02125-3393. Phone: (617) 287-5570; fax: (617) 287-5575.
- 11-14 *Sixth Symposium on Biogeochemistry of Wetlands, Ft. Lauderdale, FL.* Contact the University of Florida, IFAS Office of Conferences (352) 392-5930; fax: (352) 392-9734; e-mail: mmp@gnv.ifas.ufl.edu; web site: gnv.ifas.ufl.edu/-conferweb/#upcoming.

August 1999

- 8-11 *Water Resources into the New Millennium: Past Accomplishments, New Challenges, Seattle, WA.* The 1999 International Water Resources Engineering Conference. (800) 548-2723; web site: www.asce.org/conferences/we99/index.html; e-mail: conf@asce.org.
- 8-11 *Walk on the Wild Side, Soil and Water Conservation Society Annual Conference, Biloxi, Mississippi.* Contact Pat Mulligan (515) 289-2331, ext. 17; email: patm@swcs.org.
- 9-12 *1999 Stockholm Water Symposium: Urban Stability Through Integrated Water-Related Management, Stockholm, Sweden.* Contact the Stockholm International Water Institute at +46 -8-736-20-08; e-mail: sympos@siwi.org; web site: www.siwi.org.

September 1999

- 14-16 *The Seventh Symposium on the Chemistry and Fate of Modern Pesticides, Lawrence, KS.* Contact The University of Kansas, Division of Continuing Education, 1515 St. Andrews Drive, Lawrence, KS 66047-1625. Phone: (785) 864-4790; fax: (785) 864-5074; e-mail: bproctor@ukans.edu.
- 14-16 *6th Biennial Stormwater Research and Watershed Management Conference, Tampa, FL.* Contact Diane Caban, Southwest Florida Water Management District, Mail Code: MAN, SWFWMD, 2379 Broad Street, Brooksville, FL 34609-6899. Phone: (352) 796-7211, ext. 4297; web site: www.swfwmd.state.fl.us.
- 21-23 *9th Southern States Annual Environmental Conference and Exhibition, Biloxi, MS.* Contact MISSTAP. Phone: (601) 325-8067; fax: (601) 325-8616; e-mail: lindig@che.msstate.edu; web site: www.che.msstate.edu/misstap.
- 25-30 *15th International Estuarine Research Federation Conference, New Orleans, LA.* Contact Denise Reed, (504) 280-7395, djreed@uno.edu or Robert Twilley, (318) 482-6146, rtwilley@usl.edu.

October 1999

- 9-13 *WEFTEC '99.* Contact Water Environment Federation, Attn: WEFTEC '99 Program Coordinator, 601 Wythe Street, Alexandria, VA 22314-1994 or visit WEF's web site at www.wer.org/docs/conference.html.

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

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