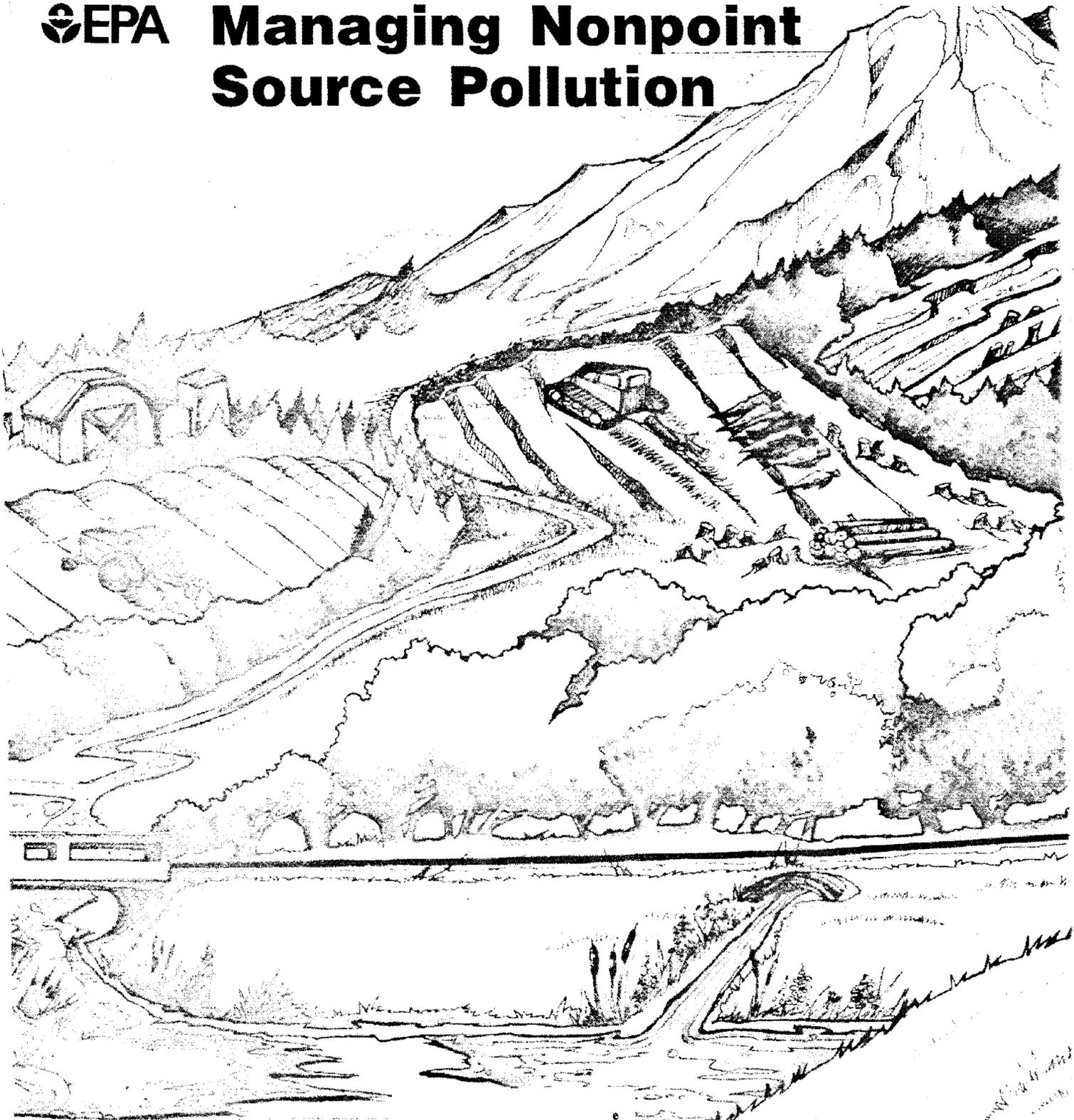




Managing Nonpoint Source Pollution



**Final Report to Congress on Section 319
of the Clean Water Act (1989)**



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Abstract: The report focuses on the state of the national effort to control nonpoint source pollution as of October 1, 1989. Included are the findings of the state nonpoint source assessments; state programs for addressing problems identified in the assessments; related activities of EPA, other federal agencies, and others; and achievements to date on controlling nonpoint source pollution. The report does not discuss implementation activities funded with Fiscal Year 1990 grants and thus may understate the current level of state nonpoint source control activities.

Managing Nonpoint Source Pollution

***Final Report to Congress
on Section 319 of
the Clean Water Act (1989)***

January 1992

Prepared by JT&A, inc. and Dynamac Corporation under contract 68-033538 for the U.S. Environmental Protection Agency. Publication does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency or of any other organization represented in this document.

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Preface

Clearly, the nation is realizing the toll nonpoint source pollution has taken — and continues to exact from our lakes, streams, rivers, and coastal waters. States are preparing to control nonpoint source pollution with techniques that vary according to geography, human activities, climate, and other factors.

Federal agencies and their regional offices support state efforts in accordance with their missions. Both state and federal efforts are described in this report, with the assessments data collected by states appearing in Appendix A.

Perhaps most important in the long term, however, is the growing participation at the local level, as demonstrated by the organizations whose statements appear in this report. These groups represent the interests of the farmer, the water resource user, the citizen who lives in an urban condo — the whole gamut of American society. The *Final Report to Congress*, then, encompasses a truly national perspective.

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The following generally-recognized abbreviations are used throughout this report:

- ACP Agricultural Conservation Practice (administered by USDA)
- ASCS Agricultural Stabilization and Conservation Service (a USDA agency)
- BLM Bureau of Land Management (Department of the Interior)
- BMPs Best management practices
- CRP Conservation Reserve Program (administered by USDA)
- EPA U.S. Environmental Protection Agency
- GIS Geographical Information Systems
- MOAs or MOUs Memorandum of Agreement — or Understanding (formal agreements between government agencies)
- SCS Soil Conservation Service (a USDA agency)
- USDA U.S. Department of Agriculture
- USGS U.S. Geological Survey

Executive Summary

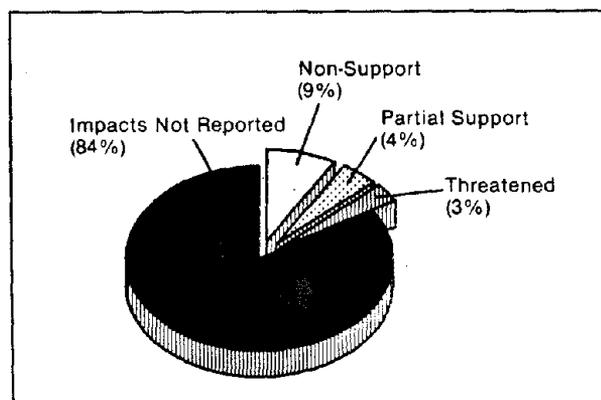
During Fiscal Year 1989 and early 1990 the states and the Environmental Protection Agency took significant steps toward implementing the national nonpoint source program under section 319 of the Clean Water Act. The states continued to take the lead in developing and submitting to EPA approvable assessment reports and management programs.

All states now have approved assessments. EPA has fully approved 44 management programs and has approved portions of all the remaining states' management programs.

EPA has awarded to the states and territories (hereafter referred to as the states) approximately \$37 million in section 319 grant funds appropriated by Congress in Fiscal Year 1990. EPA is currently in the process of awarding \$51 million in FY 1991 grants. States have begun to implement their management programs and are continuing those efforts begun prior to federal funding under section 319.

Other federal agencies, most notably the Department of Agriculture, are contributing to the control of nonpoint source pollution by assigning water quality a higher priority in their programs. In addition, the new storm water program under section 402(p) of the Clean Water Act¹ is expected to help solve urban water quality problems where urban runoff is discharged through storm water sewers.

This report focuses on the state of the national effort to control nonpoint source pollution as of October 1, 1989. Included are the findings of the state nonpoint source assessments; state programs for addressing problems identified in the assessments; related activities of EPA, other federal agencies, and others; and achievements to date on controlling nonpoint source pollution. This report does not discuss implementation activities funded with Fiscal Year 1990 grants and thus may understate the current level of state nonpoint source control activities.



Source: Section 319(a) Nonpoint Source Assessments
"Impacts Not Reported" includes both waters not impacted by nonpoint sources and waters not assessed.

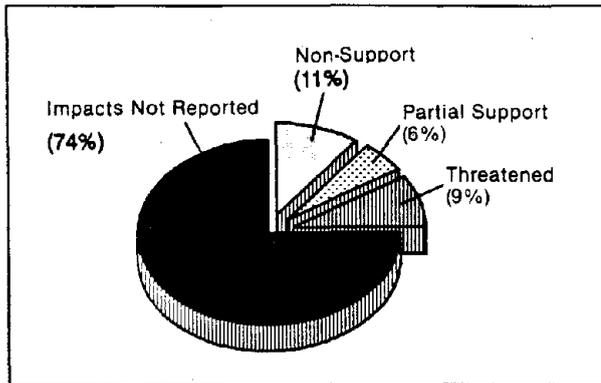
Figure 1.—Nonpoint source impacts to rivers as percentage of all river mileage (40 states reporting).

Assessment Report Findings — What are the Problems?

EPA has analyzed the nonpoint source assessment data provided by the states. Based upon those data, the following general observations can be made regarding the type and extent of nonpoint source impacts to the nation's surface waters.

- **Wildlife and recreation** are the uses most affected by nonpoint source pollution. Our rivers, lakes, estuaries, coastal waters, and wetlands are all experiencing major impacts to either, or both, of these state-designated uses. Fishing and shellfishing in the Great Lakes and coastal waters are also impacted by nonpoint source pollution. This information indicates very clearly that nonpoint source pollution has

¹ All statutory citations refer to the Clean Water Act unless otherwise specified.

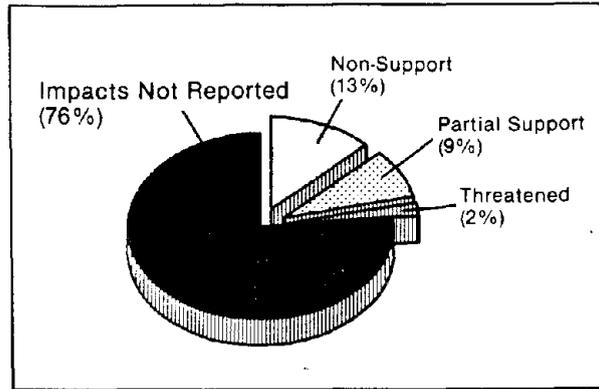


Source: Section 319(a) Nonpoint Source Assessments
 "Impacts Not Reported" includes both waters not impacted by nonpoint sources and waters not assessed.

Figure 2.—Nonpoint source impacts to lakes as percentage of all lake acreage (33 states reporting).

caused severe damage to aquatic communities nationwide and has destroyed the aesthetic values of many of our treasured recreational waters.

- **Agriculture** continues to be the single largest contributor to nonpoint source problems in the nation. It is the leading source of impacts to rivers, lakes, and wetlands.
- **Siltation and nutrients** are the pollutants responsible for most of the nonpoint source impacts to the nation's surface waters. Rivers, lakes, estuaries, and wetlands are all affected primarily by one of these two pollutants.



Source: Section 319(a) Nonpoint Source Assessments
 "Impacts Not Reported" includes both waters not impacted by nonpoint sources and waters not assessed.

Figure 3.—Nonpoint source impacts to estuaries as percentage of all estuary area (13 states reporting).

The leading sources of nonpoint pollution, the pollutants causing the greatest damage, and the state-designated uses most affected by these sources are shown for all waterbody types in Table 1.

Management Programs — What are the States Planning to Do?

The states appear to be prepared to address the major sources of nonpoint source pollution identified in their assessments. Over a quarter of the management program milestones addressed agriculture.

Table 1.—Leading sources, pollutants, and state-designated use impacts related to nonpoint source pollution.¹

WATERBODY TYPE (# STATES REPORTING)	LEADING SOURCES ²	LEADING POLLUTANTS	USES IMPACTED
Rivers (40 states)	Agriculture Unknown	Siltation Nutrients	Wildlife Recreation
Lakes (33 states)	Agriculture Unknown	Nutrients Siltation	Recreation Wildlife
Estuaries (13 states)	In-place contaminants Urban	Nutrients Pathogens	Wildlife Recreation
Coastal Waters (7 states)	Waste storage tanks Petroleum activities	Oil and grease Metals, pesticides, Pathogens, & inorganics	Shellfish, Recreation, High Quality, Industry, & Navigation
Great Lakes (2 states)	In-place contaminants Unknown	Priority organics Pesticides	Fisheries Wildlife
Wetlands (3 states)	Agriculture Hydrologic modification	Siltation Metals	Wildlife Recreational & High Quality
Ground Water (9 states)	Not available	Pesticides Unknown toxicity Priority organics	Drinking

¹ Listed sources, pollutants, and uses impacted are not necessarily linked. The number of states reporting is the maximum number that may have contributed data under each of the information columns. For example, while 40 states reported the river mileage impacted by nonpoint sources, only 33 states reported pollutant information in a quantitative manner.

² Leading sources, pollutants, and uses impacted determined by the number of miles of acres affected. Top two, with ties, are listed.

States proposed a number of nonpoint source control activities in their management programs. These included the implementation of control measures, public outreach, technical assistance, technical evaluation of projects, continued and expanded assessment of nonpoint source problems, enforcement, designation of priority waterbodies, and reporting. Projects aimed at specific watersheds are described in only about two-thirds of the management programs.

Thirty-nine states reported existing sources of state funding for nonpoint source pollution control. The predominant funding sources were general revenues, permit fees, and user fees.

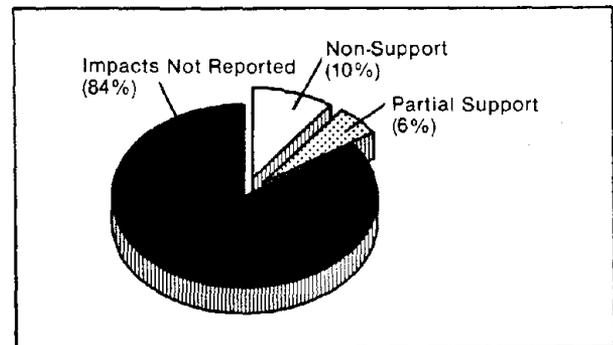
Forty-six states identified existing regulations to address nonpoint source pollution, but many of these regulations are designed for point source discharges such as animal feedlots and mining. Many states with nonpoint source regulations did not describe enforcement activities.

Forty-five states provided a list of federal projects they plan to review for consistency with their management programs. Most states will review projects using existing intergovernmental review procedures, but several will also coordinate with intergovernmental reviews provided under other statutes such as the National Environmental Policy Act and the Coastal Zone Management Act.

Progress Made in Reducing Nonpoint Source Pollution

Because the implementation phase of the section 319 program is only beginning in 1990, it is premature to try to determine water quality improvements resulting from state programs. Moreover, the experience gained by EPA and the states under such programs as the Rural Clean Water Program (RCWP), the Nationwide Urban Runoff Program (NURP), the Clean Lakes Program, the Great Lakes Program, and the Chesapeake Bay Program tells us that the response of natural systems to changes in human activities may take several years or more. The documentation of this response is often difficult, requiring consistent, rigorous monitoring and sometimes highly sophisticated analytic techniques.

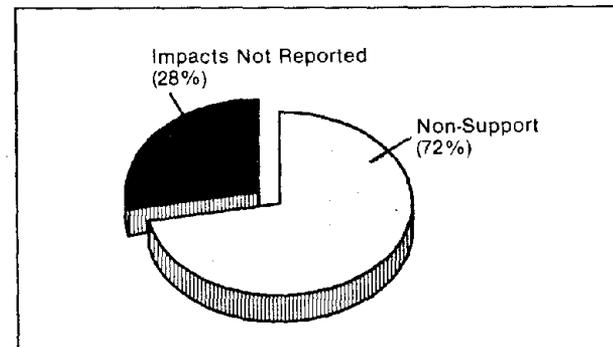
The states have succeeded, however, in achieving and documenting water quality improvement in a number of cases. For example, water quality has demonstrably improved in at least four of the RCWP projects (Florida, Idaho, Oregon, and Utah). The nonpoint source control measures in these projects primarily addressed animal waste problems and sediment yields from irrigated croplands.



Source: Section 319(a) Nonpoint Source Assessments

"Impacts Not Reported" includes both waters not impacted by nonpoint sources and waters not assessed.

Figure 4.—Nonpoint source impacts to coastal waters as percentage of all coastal area (7 states reporting).



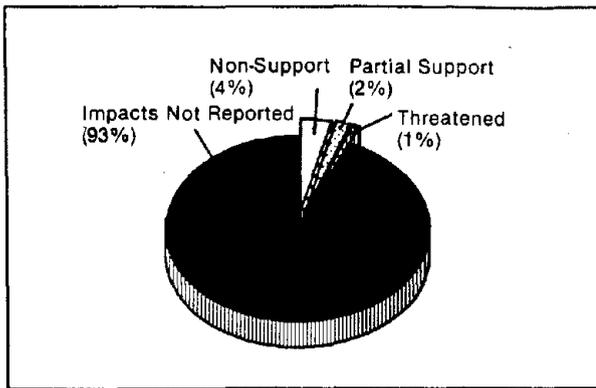
Source: Section 319(a) Nonpoint Source Assessments

"Impacts Not Reported" includes both waters not impacted by nonpoint sources and waters not assessed.

Figure 5.—Nonpoint source impacts to Great Lakes as percentage of all Great Lakes area (2 states reporting—Indiana and New York). Note: Indiana's total area estimated as 350 mi².

It is clear from the RCWP experience that many states have the knowledge and tools to solve these types of agricultural problems. In Iowa, the Green Valley Lake Clean Lakes project has reduced total phosphorus concentration 75 percent, algal growth fourfold, and sediment delivery to the lake by half. Fish growth rates have increased. Treatment of an abandoned mine site in Alice, Colorado, improved the quality of nearby Little Creek by increasing the pH to more acceptable levels.

These examples illustrate the point that improvements in water quality are achieved locally. Knowing this, the states and EPA are working together to establish effective statewide awareness and assistance programs and implement targeted pollution control measures in high priority watersheds.



Source: Section 319(a) Nonpoint Source Assessments
"Impacts Not Reported" includes both waters not impacted by nonpoint sources and waters not assessed.

Figure 6.—Nonpoint source impacts to wetlands as percentage of all wetland area (3 states reporting).

Section 319(m)(2) of the Clean Water Act requires EPA, in addition to describing the states' progress in addressing nonpoint source pollution, to make recommendations concerning future programs for controlling nonpoint source pollution. However, recommendations concerning future nonpoint source control programs need to be considered in a broader context that would include an overall assessment of existing Clean Water Act programs. EPA plans to conduct this assessment, including an evaluation of the need for any changes in the current nonpoint source program, in the context of an overall evaluation of options for reauthorizing the Clean Water Act.

I. Introduction

Background

Section 319(m) of the Clean Water Act requires EPA to transmit a final report on the activities carried out under section 319. The statute requires that, at a minimum, the report:

- describe the management programs being implemented by the states by types and amount of affected navigable waters, categories and subcategories of nonpoint sources, and types of best management practices being implemented;
- describe the experiences of the states in adhering to schedules and implementing best management practices;
- describe the amount and purpose of grants awarded pursuant to subsections (h) and (i) of this section;
- identify, to the extent that information is available, the progress made in reducing pollutant loads and improving water quality in navigable waters;
- indicate what further actions need to be taken to attain and maintain applicable water quality standards and the goals and requirements of the Clean Water Act;
- include recommendations of the Administrator concerning future programs, including enforcement programs, for controlling pollution from nonpoint sources; and
- identify the activities and programs of departments, agencies, and instrumentalities of the United States that are inconsistent with the management

programs submitted by the states and recommend modifications so that such activities and programs are consistent with and assist the states in implementation of such management programs.

Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, or seepage. Although nonpoint sources have been described in a number of ways, they are defined as sources of water pollution that do not meet the legal definition of "point source" in section 502(14) of the Clean Water Act:²

The term "point source" means any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

Although diffuse runoff is generally treated as a nonpoint source, runoff that enters and is discharged from conveyances such as those described are point sources and subject to the permitting requirements of the Clean Water Act. In contrast, nonpoint sources are not subject to federal permits and are usually addressed through voluntary programs.

The distinction between nonpoint sources and diffuse point sources, such as storm water sewers, may be subtle and is often blurred by states in describing the effects of nonpoint sources. However, in most states, it is reasonable to conclude that nonpoint sources including certain diffuse point sources (e.g., storm water discharges) are now responsible

² All statutory citations refer to the Clean Water Act unless otherwise specified.

for between one-third and two-thirds of existing and threatened impairments of the states' waters.

There are many reasons why nonpoint sources are such a large component of our nation's water pollution problem. Diffuse sources are often harder to identify, isolate, and control than traditional point sources. Perhaps for these reasons, from the passage of the Clean Water Act in 1972 through 1987, EPA and the states focused on issuing permits to point sources, then inspecting, monitoring, and enforcing those permits to ensure that point sources met the Act's requirements.

During that period (1972-1987), the federal government alone invested over \$50 billion assisting local communities in constructing secondary treatment plants to meet Clean Water Act requirements, with relatively little emphasis on nonpoint sources. While several states had substantial programs to help farmers conserve soil and water or control agricultural nonpoint source pollution, many states did not have a single staff person specializing in the identification, prevention, and control of nonpoint source water pollution.

In 1987, reflecting increased awareness of the scope and diversity of nonpoint source pollution, Congress enacted section 319 to encourage states to increase their control of nonpoint source pollution. This new provision created a three-stage national program to be implemented by the states with federal approval and assistance:

1. State nonpoint source assessment reports,
2. State nonpoint source management programs, and
3. Implementation of the state nonpoint source management programs.

This Report

This report describes the status of the national effort to control nonpoint source pollution as of October 1, 1989. Where possible, more current information concerning the final approval of state nonpoint source assessments and management programs and the issuance of grants in 1990 is also provided.

In its Fiscal Year 1988 Report to Congress, EPA summarized the status of state nonpoint source assessments and management programs, state activities, and the nonpoint source activities of EPA and other federal agencies. As of October 1, 1989, however, few state nonpoint source assessments and management programs had been completed and approved, and in some states, significant implementation of these programs had yet to begin. Major

events have occurred since the FY 1988 report was submitted:

- All states now have EPA-approved nonpoint source assessments.
- EPA also has fully approved 44 state nonpoint source management programs and approved portions of all the remaining state management programs.
- Congress appropriated \$40 million in FY 1990 and \$51 million in FY 1991 for section 319 state grants to implement approved state programs.
- EPA has awarded all of the appropriated FY 1990 grant funds, based upon work programs developed by the states. The states have begun to use this assistance to implement their nonpoint source management programs and to continue ongoing nonpoint source management activities.
- The storm water program under section 402(p) of the Clean Water Act moved closer to implementation. An initial set of storm water regulations for large municipalities and certain industrial storm water discharges was promulgated in November 1990.
- The U.S. Department of Agriculture began to implement a significant set of technical assistance and cost-share activities under the president's Water Quality Initiative to control nonpoint source pollution from agriculture. In late 1990, Congress passed the 1990 Food Security Act, which expanded the set of water quality programs in the conservation title.
- Congress passed the Coastal Zone Act Reauthorization Amendments of 1990 requiring state development of coastal Nonpoint Pollution Control Programs.

These and many other activities by federal, state, and local governments and by citizens are evidence of the increased commitment at all levels to protect and enhance water quality by controlling nonpoint source pollution.

Improving the quality of this nation's waters will take time, particularly because, as this report documents, nonpoint source pollution is such a pervasive problem. This report outlines how the states, EPA, and others have begun to address the problem and describes their efforts and achievements to date.

Beginning with a discussion of EPA's efforts in administering the national nonpoint source program under section 319, this report continues with a summary of the states' nonpoint source assessments and management programs. EPA regional and state highlights and reports comprise the next section. Nonpoint source control programs within EPA and other federal agencies are then described, followed by discussions of other related programs, activities, and issues.

Section 319(m)(2) of the Clean Water Act requires EPA, in addition to describing the states' progress in addressing nonpoint source pollution, to make recommendations concerning future programs for controlling nonpoint source pollution. However, recommendations concerning future nonpoint source control programs need to be considered in a broader context that would include an overall assessment of existing Clean Water Act programs. EPA plans to conduct this assessment, including an evaluation of the need for any changes in the current nonpoint source program, in the context of an overall evaluation of options for reauthorizing the Clean Water Act.

The Nonpoint Source Program Moves Forward

The period of 1989 and early 1990 has been the most challenging to date in the national nonpoint source program. By January 4, 1990, EPA's regional offices, working closely with the states, had approved all state nonpoint source assessments, 44 state management programs, and portions of 12 other state programs.

Congress appropriated \$40 million for section 319 grants on November 9, 1989, and EPA and the states took less than four months to complete the grants process for approved nonpoint source programs.

By December 1, 1989, EPA gave the states initial planning targets, and by December 15, 1989, issued detailed guidance on the criteria, priorities, and conditions for awarding the grants. The guidance stressed the principle that section 319 grants are not entitlements and that states' actual grant amounts may be higher or lower than the initial planning targets, in accordance with the quality of the states' proposed grant work programs. States responded by submitting draft grant applications by February 15. Most grants were awarded by March 1, 1990, with the remainder awarded by June 1, 1990.

While the state assessments, management programs, and grants were the primary focus of EPA's

activities, EPA also continued or began other activities to promote national awareness and effective control of nonpoint source pollution. To assist EPA in defining the goals of the nonpoint source program, and the means to attain those goals, EPA developed the *Nonpoint Source Agenda for the Future* (January 1989).

The overall goal of the Agenda is to protect and restore designated uses of the nation's waters by providing strong leadership for the national nonpoint source program and by helping states and local governments overcome barriers to successful implementation of nonpoint source control measures. Among these barriers are (1) inadequate public awareness of the nonpoint source problem, (2) inadequate knowledge and/or transfer of knowledge regarding successful solutions to nonpoint source problems, and (3) inadequate incentives to correct nonpoint source pollution.

EPA developed five Nonpoint Source Agenda themes through which to pursue its national goal:

- **Public Awareness**—help states and local governments raise the level of public awareness about the effects of nonpoint source pollution.
- **Successful Solutions**—provide states and local governments with information on practical, feasible solutions to prevent or control nonpoint source pollution.
- **Economic Forces**—examine the economic forces that contribute to the nonpoint source problem by encouraging environmentally unsatisfactory behavior.
- **Regulatory Solutions**—help states and local governments improve their own regulatory capabilities.
- **Good Science**—develop the tools states and local governments need to establish sound water quality-based programs for nonpoint source control, particularly water quality criteria and monitoring protocols designed to evaluate nonpoint source controls.

These five themes of the Nonpoint Source Agenda were developed before funding was appropriated under section 319. The FY 1990 appropriation of nonpoint source funds has had a major effect on how EPA can address these themes. EPA intends to respond to commitments made in the Agenda over a five-year period that began in FY 1989. The following paragraphs describe some of the progress EPA has made in addressing Agenda themes.

Agenda Highlights and Progress

Public Awareness

HIGHLIGHTS

EPA has pledged to work with states and local governments to improve their capacity to educate the public about the causes and effects of nonpoint source pollution and thus encourage behavioral changes and responsible stewardship of our water resources.

The Agency will initiate a national public awareness program to help build consensus and mobilize citizens. EPA will encourage states and local governments to adopt targeted, watershed management approaches that provide a common basis for citizen support and involvement. EPA is also committed to work with the states, federal departments and agencies, and others to produce high quality educational materials and to train teachers.

PROGRESS

The Agency has initiated the first phases of its public awareness program. EPA's first nonpoint source brochure and poster were printed in early 1990. Over 450,000 copies of the brochure and 100,000 copies of the poster have been distributed to the public with the assistance of states, conservation districts, and citizens' groups. These materials are intended to add "nonpoint source pollution" to the public's vocabulary, and to provide basic background about the types of nonpoint source pollution and ways to prevent it.

In addition, EPA has developed or supported numerous information and education materials addressing a wide range of nonpoint source topics. EPA has been working with states to develop statewide and local information and education programs as part of all approved section 319 management programs and grant work programs.

EPA is actively supporting the dissemination of public education programs through the development of a public outreach clearinghouse, the Nonpoint Source Information Exchange. This includes an inventory of existing nonpoint source awareness materials, including videos, brochures, citizens' guides, manuals, posters, and curricula. EPA has already published a catalogue of existing materials and is reviewing them to identify those that best address specific nonpoint source control issues. EPA's goal is to provide the best available materials to state and local nonpoint source program managers to assist them in educating the public about nonpoint source pollution.

Successful Solutions

HIGHLIGHTS

Under this theme EPA has pledged to actively solicit help in setting up information networks to provide states and local governments with useful, up-to-date information on feasible solutions to existing problems and ways to prevent future problems. This activity goes hand-in-hand with public awareness efforts.

PROGRESS

EPA took a major step toward achieving results under this theme by establishing *Nonpoint Source News-Notes*, an occasionally published vehicle for sharing success stories among states, communities, agencies, and others interested in nonpoint source control. This publication, currently reaching nearly 5,000 professionals and lay persons, describes nonpoint source program activities at the federal, state, and local levels, including technical, institutional, and incentive-based means for achieving nonpoint source pollution control. Eight issues were published in FY 1990.

EPA has also made considerable progress in developing the Nonpoint Source Information Exchange. This will include an electronic bulletin board dedicated to nonpoint source issues. The bulletin board came on-line during 1990. EPA is also developing a Manager's Bibliography featuring major existing resources on nonpoint source pollution control topics.

Economic Forces

HIGHLIGHTS

Under this theme, EPA intends to deal with both removing or reducing the financial incentives to pollute and providing financial incentives to prevent or correct problems. To assist and support state and local efforts to devise their own financing mechanisms, EPA pledged to establish a central clearinghouse for innovative state and local funding ideas that will cover nonpoint source as well as other water programs such as wetlands, ground water, and estuaries.

EPA also has agreed to help match state and local needs with resources of other federal agencies to foster joint efforts to support state nonpoint source programs. Finally, EPA will attempt to influence federal policy decisions that drive the kinds of behavior that cause nonpoint source pollution.

PROGRESS

Nonpoint Source News-Notes is EPA's primary vehicle for sharing success stories among states concerning financial solutions to nonpoint source problems. EPA also has published *Share the Costs — Share the Benefits*, a guide for states on the use of cost-share programs to encourage BMPs.

EPA has worked with the U.S. Department of Agriculture to link the president's Water Quality Initiative with state nonpoint source program activities and needs. Some successful matches between state nonpoint source activities and the USDA initiative programs have already resulted and more are expected in the near future.

EPA has taken an active role in shaping the new Farm Bill and coastal legislation and has begun meaningful dialogue with other federal agencies such as the Forest Service, the Bureau of Reclamation, and the National Oceanic and Atmospheric Administration. EPA will increase support for interagency cooperation to control nonpoint source pollution in the years ahead.

Regulatory Solutions

HIGHLIGHTS

EPA has pledged to assist states and local governments as they seek regulatory solutions to nonpoint source problems. A clearinghouse and information transfer workshops were identified as the means for providing this assistance.

EPA plans to explore ways to more effectively integrate nonpoint source considerations into its existing regulatory network, including the Clean Water Act, the Safe Drinking Water Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Toxic Substances Control Act. In addition, EPA will explore ways for states to make better use of their anti-degradation policies to fully protect existing uses from being harmed by nonpoint source pollution.

PROGRESS

As described earlier, *Nonpoint Source News-Notes* is EPA's major vehicle for sharing information regarding regulatory solutions to nonpoint source pollution.

In support of state and local efforts to develop regulatory solutions to nonpoint source problems, EPA continues to develop its storm water regulatory program under the authorities of subsection 402(p) of the Clean Water Act as amended in 1987. Similarly, EPA is assessing its accomplishments and needs under the National Pollutant Discharge Elimination System (NPDES) program as it relates to concentrated animal feeding operations (40 CFR Part 122.23). Furthermore, EPA has supported state and local regulatory efforts with section 319 grants. State regulatory activities are discussed in Chapter IV.

Good Science

HIGHLIGHTS

EPA is committed to research and develop various approaches for establishing water quality standards that better address nonpoint source problems, with a focus on narrative, and numeric sediment and biological criteria. EPA also plans to develop better assessment methodologies for nonpoint source impacts.

PROGRESS

In April 1990, EPA published *Biological Criteria—National Program Guidance for Surface Waters*, a document on the effective use of biological criteria and standards in state water quality programs (EPA 440-15-90-004, April 1990). In addition, EPA's draft *Water Quality Standards Framework* (December 1989) includes as EPA priorities for FY 1991-93 the publication of (1) six estuarine criteria; (2) acute/wet weather values for pH, total suspended solids, and bacteria; and (3) guidance on ways to narratively link nonpoint source control programs to water quality standards.

Agricultural runoff containing large amounts of pesticides, nutrients, and sediments can adversely affect the biological integrity of aquatic systems. A 1990 study by EPA's Office of Policy, Planning, and Evaluation to determine the extent of ecological benefits arising from installing vegetative filter strips along streams that are adjacent to agricultural cropland confirms that such practices improve stream communities. The study evaluated the quality of in-stream biological communities rather than chemical or physical conditions of the water resource, because the most important criterion of a healthy stream is whether it can support ecologically rich biota in a sustainable manner. After selecting sites with two-year-old filter strips and control sites without filter strips, both of which had similar physical and land use attributes, the researchers analyzed detailed physical, chemical, and biological parameters, including samples of macroinvertebrates and fish.

The study found that vegetative filter strips can provide benefits to headwater stream ecosystems (first and second order streams) that drain agricul-

tural croplands. Analyses of benthic macro-invertebrates showed significant differences between filter strip and control sites. The total number of benthic macroinvertebrates was greater at the sites with filter strips than at the sites without the strips. In addition, species richness and the density of fish was higher at the filter strip sites than at the control sites in three out of the four pairs of sites. The researchers concluded that vegetative filter strips can be effective in limiting movement of sediment and nutrients to streams and therefore they provide ecological benefits to aquatic biota.

EPA's future priorities may include the publication of guidance on (1) the development and use of numeric biological criteria for estuaries and wetlands; (2) the development of nutrient criteria; (3) the refinement of wetland quality standards; (4) the development and implementation of comprehensive numeric water quality standards for coastal waters; and (5) ways to numerically link nonpoint source programs to water quality standards.

EPA continues to develop technical tools to assist states in developing effective nonpoint source control programs. The Agency has moved forward in developing its database summarizing the water quality to be expected from various agricultural treatments and will continue to support this effort. EPA also is testing one of the many nonpoint source models currently in use to see if it predicts water quality accurately or adequately. The Agency has developed draft guidance on nonpoint source monitoring and evaluation techniques and completed this guidance in 1991. Technical support is also provided to the states regarding nonpoint source monitoring protocols for watershed projects funded under section 319.

Targeting techniques and BMPs (best management practices) selection guidance for agricultural and urban areas have been developed for state use. Given the scope of the nonpoint source problem, it is necessary for EPA, states, and local governments to set priorities for nonpoint source programs. EPA, therefore, has developed and distributed guidance on this issue as well.

EPA should provide much more help to the states as they grapple with their nonpoint source problems. EPA will continue to foster the develop-

ment and adaptation of existing and new technology to gradually establish a proven technical backing for state nonpoint source programs.

Nonpoint Source Funding

The Fiscal Year 1988 report described several EPA grant programs that can be used to fund nonpoint source control activities and indicated that the most important federal funding sources at that time came from appropriations under Title II of the Clean Water Act. For example, the largest source of EPA funding for nonpoint source control in FY 1989 was section 205(j)(5) grants. In FY 1989, these funds totaled \$10,642,474 as compared to \$23,123,010 in FY 1988. EPA also made grants under section 201(g)(1)(B).

While the Clean Water Act requires that all states reserve at least 1 percent of their Title II appropriations for nonpoint source activities funded under section 205(j)(5), the Act allows states (with EPA concurrence) to transfer up to 20 percent of their Title II allotments for nonpoint source use. To date, four states have used this provision to fund nonpoint source programs.

Pursuant to changes in the Clean Water Act enacted by Congress in the Water Quality Act of 1987, Title II funding has essentially been phased out and replaced by a new Title VI program, which provides grants for State Water Pollution Control Revolving Funds (SRF). In this new program, EPA can make capitalization grants to states to establish a revolving fund for a number of purposes, including a section 319 management program. Title VI thus offers the potential for continued significant levels of state assistance to nonpoint source control activity.

The most significant new federal funding source for state section 319 nonpoint source management programs is the section 319 appropriation. In November 1989, Congress appropriated \$40 million in section 319 FY 1990 funds to assist states to implement their approved nonpoint source management programs. Table 2 lists the amount of section 319 funds awarded to each state.

Congress appropriated \$51 million in section 319 FY 1991 funds. EPA is currently in the process of awarding this to the states.

**Table 2.—Nonpoint source (319) grant awards status
as of September 13, 1990.**

STATES TERRITORIES	AWARD
AL	\$ 653,298
AK	\$ 48,000
AZ	\$ 555,420
AR	\$ 660,299
CA	\$ 1,894,478
CO	\$ 512,582
CT	\$ 309,825
DE	\$ 378,000
DC	\$ 169,089
FL	\$ 1,294,380
GA	\$ 823,934
HI	\$ 258,722
ID	\$ 790,995
IL	\$ 750,000
IN	\$ 565,000
IA	\$ 846,851
KS	\$ 878,401
KY	\$ 578,000
LA	\$ 845,937
ME	\$ 462,084
MD	\$ 447,000
MA	\$ 383,687
MI	\$ 1,293,000
MN	\$ 1,276,000
MS	\$ 703,200
MO	\$ 745,091
MT	\$ 553,377
NE	\$ 864,622
NV	\$ 294,518
NH	\$ 147,746
NJ	\$ 585,000
NM	\$ 354,510
NY	\$ 1,211,052
NC	\$ 796,972
ND	\$ 667,700
OH	\$ 1,074,000
OK	\$ 608,944
OR	\$ 537,018
PA	\$ 500,425
RI	\$ 313,062
SC	\$ 536,380
SD	\$ 695,067
TN	\$ 531,839
TX	\$ 1,632,036
UT	\$ 387,500
VT	\$ 287,114
VA	\$ 777,000
WA	\$ 870,621
WV	\$ 593,000
WI	\$ 1,077,000
WY	\$ 220,000
AS	\$ 94,260
GU	\$ 94,260
MP	\$ 94,260
PR	\$ 200,000
TT	\$ 94,260
VI	\$ 0 (ineligible: no approved management program by 1/4/90 deadline)
TOTAL	\$34,816,816*

* This figure does not include grants to Indian Tribes and designated set-asides.

II. Assessments

Section 319(a) requires the states to identify those navigable waters impacted or threatened by nonpoint sources and to identify the pollution sources affecting those same waters.

This chapter reports national summary results based upon information contained in the approved assessment reports of 41 states, Puerto Rico, and the Virgin Islands (all are referred to as states hereafter, making the total 43). The remaining 10 assessments did not contain sufficient quantitative information for inclusion in this summary.

The data provided by the states in their approved nonpoint source assessments provide the most comprehensive and detailed picture to date of the nationwide scope and effects of nonpoint source pollution. The information summarized in this chapter should be treated with caution, however, since not all states provided data that could be used in EPA's analyses. For example, some states did not report the number of miles or lake acres affected by particular types of nonpoint sources. Therefore, numbers used in this report are generally based on the subset of states that provided usable quantitative data (see Table 1).

National Summary

The state-designated uses (Table 3) of our nation's waters most severely impacted by nonpoint source pollution are wildlife (e.g., support of indigenous species of fish and waterfowl) and recreation (e.g., swimming). Our rivers, lakes, estuaries, coastal waters, and wetlands are all experiencing major effects on either, or both, of these uses. Fishing and shellfishing in the Great Lakes and coastal waters are also affected by nonpoint source pollution.

The information reported in the states' assessments indicates very clearly that nonpoint source

pollution has severely damaged aquatic communities nationwide and has destroyed or is threatening the aesthetic values of many of our treasured recreational waters.

- **Nonpoint sources** are also responsible for many health-related impairments nationwide: fishing and shellfishing are limited in many coastal areas because of pathogen contamination by animal wastes and pesticides; in other places, ground water cannot be used for drinking water because of nitrate contamination. Still other effects occur in specific waterbodies.
- **Agriculture** continues to be the single largest source of nonpoint source pollution problems in the nation.
- **Siltation and nutrients** are the pollutants causing the greatest share of the nonpoint source impacts to the nation's surface waters.

Databases Used

All states provided a list of waters affected by nonpoint source pollution, but the informational content and quality of these lists vary considerably, from North Dakota's comprehensive approach to Alaska's very brief summary. Ground-water data in particular are mostly qualitative, largely because section 319 did not require states to list those aquifers or wells affected by nonpoint sources. EPA's analysis uses only those lists for which states identified the size of impacted waters. For this reason, this report underestimates the extent of the nonpoint source problems in the nation. For a more complete version of EPA's assessment database see Appendix A.

Table 3.—Designated uses and support levels.

WILDLIFE	Fish & aquatic wildlife
FISHERY	Warmwater fishery Coldwater fishery
SHELLFISHERY	Shellfish protection
DRINKING	Domestic water supply
AGRICULTURE	Irrigation Livestock watering
INDUSTRY	Industrial
RECREATION	Primary contact Secondary contact Noncontact
NAVIGATION	Navigation
HIGH QUALITY	High quality nondegradation
Supported	= all uses supported
Partial Support	= one use <i>not</i> supported
Non-support	= 2 or more uses <i>not</i> supported
Threatened	= all uses supported, but one or more uses threatened

Data Elements

This summary of state assessments provides the following categories of information:

- **Waterbody Type:** *Lake/Pond, River/Stream/Ditch/Canal, Great Lake, Estuary, Ocean/Coastal, Wetland/Marsh, Ground Water.*
- **Use Support Status:** *Non-Support, Partial Support, Threatened*
- **Designated Uses:** *Fish & Aquatic Wildlife, Cold/Warm Water Fishery, Shellfish, Water Supply, Agriculture, Industry, Recreation, Navigation, and High Quality/Nondegradation (Table 3).*
- **Evaluation Type:** *Monitored (assessed using chemical/biological sampling data or special survey), or Evaluated (assessed using other than monitored data, including surveys of fisheries personnel, predictive modeling based on knowledge of sources and land use types, etc.)*
- **Sources:** *States used an amended section 305(b) list to identify sources of pollution (see Table 4).*
- **Pollutants/Causes:** *States used an amended section 305(b) list to identify causes of pollution (see Table 5).*

States' nonpoint source assessments are designed to identify waters affected by nonpoint source pollution and then to identify the nature and sources of this pollution. States identify impacts by comparing a waterbody's existing or threatened condition with the condition needed to support the "designated uses" that the states have designated as appropriate for the waterbody (e.g., fishing, drinking, swimming, navigation, agriculture, etc.). Impacts are classified into three degrees of severity: (1) the waterbody does not support designated uses; (2) the waterbody partially supports designated uses; and (3) the waterbody's designated uses are supported but threatened.

States have identified impairments of waters in a variety of ways, ranging from extensive and rigorous chemical, physical, or biological monitoring to visual observation and evaluation of land uses in the watershed. This report is thus based on states' reports on both "monitored" and "evaluated" waters.

The states' assessments may in some cases overstate nonpoint source impacts, given the difficulty of characterizing certain sources as point or nonpoint (Table 4). For example, some states have reported the effects of in-place contaminants on the nation's estuaries and the Great Lakes, waste storage and storage tank leaks in coastal areas, priority organics in the Great Lakes, oil and grease problems in coastal waters, and metals contamination of wetlands as significant nonpoint source problems. Some of these may include point sources, although a fair share are probably caused by nonpoint sources.

Methodology

EPA extracted data from state assessments in a consistent manner, employing a set of established rules. These rules, for the most part, governed the manner in which EPA attributed sizes of impacted waters to various designated uses, sources, and pollutants. For a detailed discussion of EPA's methodology, see Appendix B.

Although their general conclusions are comparable, this report differs in a number of ways from *National Water Quality Inventory: 1988 Report to Congress* (prepared under section 305(b) of the Clean Water Act). For example, methodologies used to report and analyze data differed in response to different requirements of the Clean Water Act. In many cases, the state 319 reports were submitted later, often by different agencies, and may reflect newer information than the 305(b) report. For a detailed explanation, see Appendix C.

Table 4.—Source category codes used by states to identify nonpoint source impairments.*

10	<u>Agriculture</u>
	11: Non-irrigated crop production
	12: Irrigated crop production
	13: Specialty crop production (e.g., truck farming and orchards)
	14: Pastureland (Grazing)
	15: Rangeland (Grazing)
	16: Feedlots—all types
	17: Aquaculture
	18: Animal holding/management areas
	19: Unspecified &/or Odd
20	<u>Silviculture</u>
	21: Harvesting, reforestation, residue management
	22: Forest management
	23: Road construction/maintenance
	29: Unspecified
30	<u>Construction</u>
	31: Highway/road/bridge
	32: Land development
	38: Railroads
	39: Unspecified
40	<u>Urban Runoff</u>
	41: Storm sewers (source control)
	42: Combined sewers (source control)
	43: Surface runoff
	45: Shipyards
	46: Marinas
	49: Unspecified
50	<u>Resources Extraction/Exploration/Development</u>
	51: Surface mining
	52: Subsurface mining
	53: Placer mining
	54: Dredge mining
	55: Petroleum activities
	56: Mill tailings
	57: Mine tailings
	59: Unspecified
60	<u>Land Disposal (Runoff/Leachate from Permitted Areas)</u>
	61: Sludge
	62: Wastewater
	63: Landfills
	64: Industrial land treatment
	65: On-site wastewater systems (septic tanks, etc.)
	66: Hazardous waste
	69: Unspecified
70	<u>Hydrologic/Habitat Modification</u>
	71: Channelization
	72: Dredging
	73: Dam construction
	74: Flow regulation/modification
	75: Bridge construction
	76: Removal of riparian vegetation
	77: Shoreline for lakes/streambank modification/destabilization/erosion
	78: Ag streambank erosion (Sub of 10)
	79: Unspecified
80	<u>Other</u>
	81: Atmospheric deposition
	82: Waste storage/storage tank leaks
	83: Highway maintenance and runoff
	84: Spills
	85: In-place contaminants
	86: Natural
	87: Recreational activities
	88: Growth urban
	89: Unspecified &/or Odd
90	<u>Source Unknown</u>

* This may include both point and nonpoint sources.

Table 5.—Pollutants/causes codes.

1 = unknown toxicity
2 = pesticides
3 = priority organics
4 = nonpriority organics
5 = metals
6 = ammonia
7 = chlorine
8 = other inorganics
9 = nutrients
10 = pH
11 = siltation
12 = organic enrichment/DO
13 = salinity
14 = thermal modification
15 = flow alteration
16 = other habitat alterations
17 = pathogens
18 = radiation
19 = oil and grease
20 = not reported

Detailed Summaries by Waterbody Type

RIVERS

Forty states reported nonpoint source impacts to 206,179 miles of rivers and streams, representing 11.4 percent of the nation's 1.8 million miles of river (Fig. 7) and 16 percent of the miles in those states reporting. Monitoring data were used to identify 32 percent of these impaired miles; evaluations were used to identify an additional 62 percent.

Support of Designated Uses

Of the 40 states identifying impacted waters, only 20 identified the uses that were affected. Based on these 20 state reports (covering 73,726 miles), wildlife and recreation appear to be the most affected uses (Fig. 8). The information from these 20 states also suggests the following:

- **Non-support:** More than half the impacted river miles cannot support designated uses because of nonpoint source impacts. Wildlife, recreation, warm/coldwater fisheries, drinking water, and agriculture are most adversely affected.

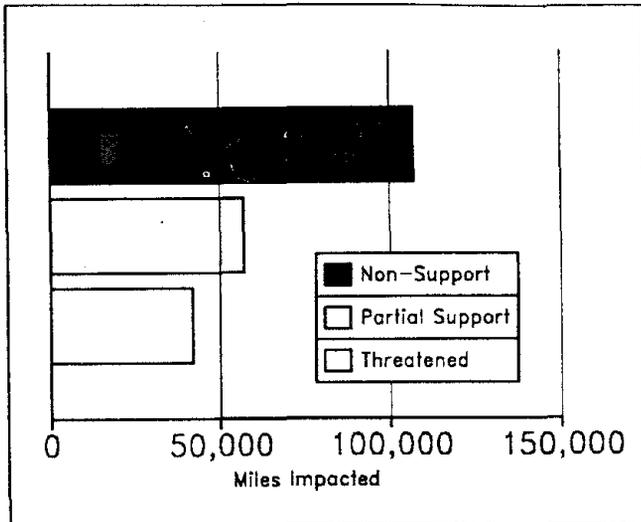


Figure 7.—Nonpoint source impacts to designated uses in the nation's rivers (40 states reporting).

- **Partial Support:** Nonpoint source pollution has caused river uses to be only partially supported on about 28 percent of the impacted miles of rivers in the nation. Uses affected most were wildlife, recreation, fisheries, agriculture, and drinking water.
- **Threatened Support:** Uses are threatened on about 20 percent of the nation's impacted river miles. Again, wildlife uses dominate, followed by recreation, fisheries, agriculture, and drinking water.

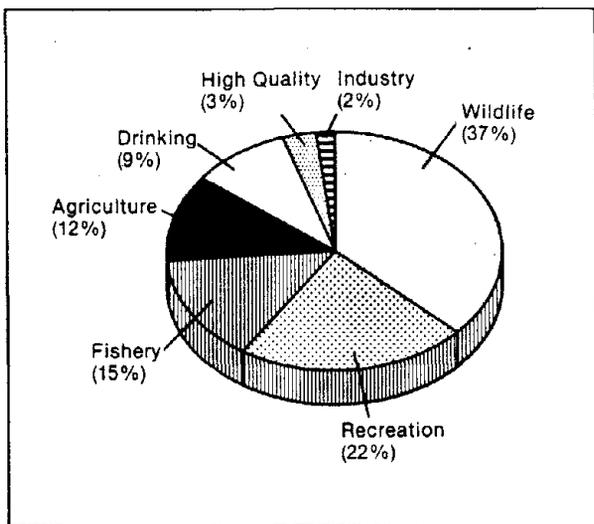


Figure 8.—Designated river uses impacted by nonpoint sources (20 states reporting).

Pollutants/Causes

According to the 33 states reporting the causes of nonpoint source impacts, siltation is the major pollutant affecting rivers and streams (Fig. 9). Nutrients, pathogens, metals, and pesticides are present in varying degrees.

Nationally, the greatest share of the reported siltation problem is found in Missouri (Fig. 10); nutrients, North Dakota (Fig. 11); pathogens, Virginia; metals, Colorado; pesticides, Iowa; habitat modification, Montana; and organic enrichment, North Carolina.

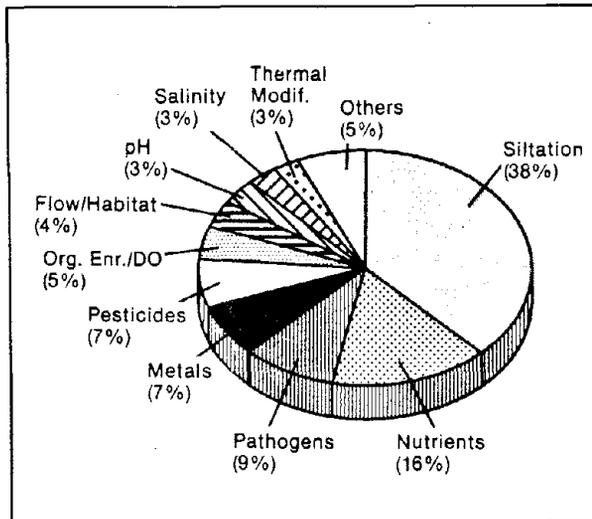


Figure 9.—Pollutants impacting use support in rivers (33 states reporting).

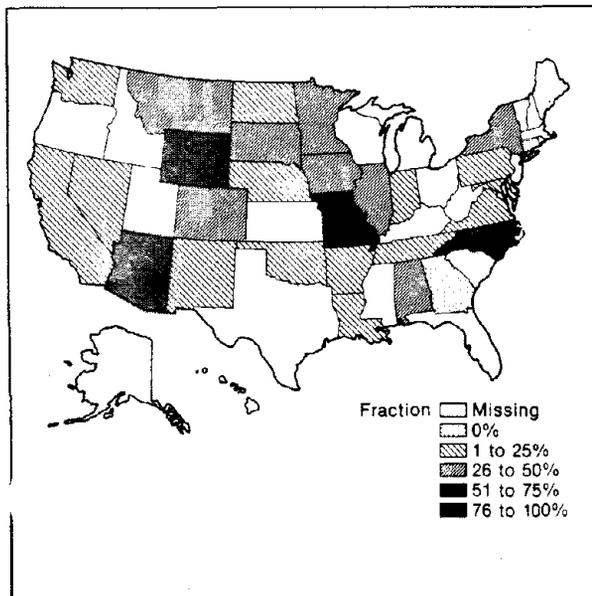


Figure 10.—Fraction of river impacts caused by siltation (33 states reporting).

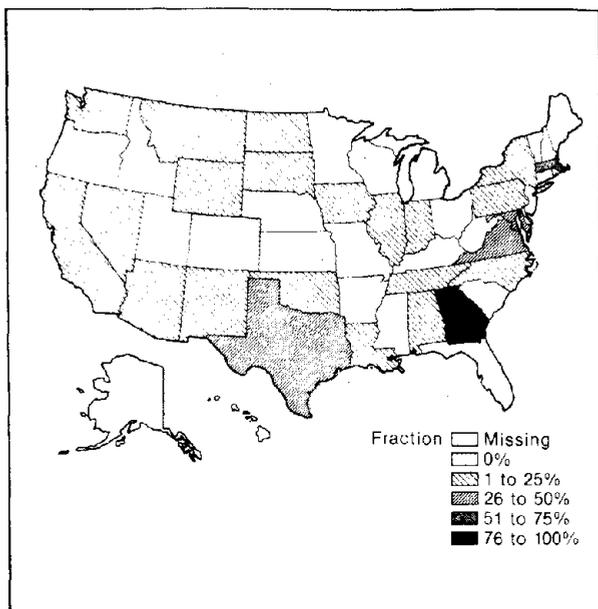


Figure 11.—Fraction of river impacts caused by nutrients (33 states reporting).

Sources

With sources affecting uses reported for nearly all the miles covered, agriculture is the largest source of nonpoint source impacts to rivers (Fig. 12). In fact, aside from natural causes, the top four sub-categories (non-irrigated crop production, livestock, range lands, and irrigated crop production) are all from agriculture.

Surface mining, streambank modification (including agricultural streambank impacts), on-site wastewater systems, subsurface mining, petroleum activities, channelization, flow regulation/modification, and urban runoff follow in that order.

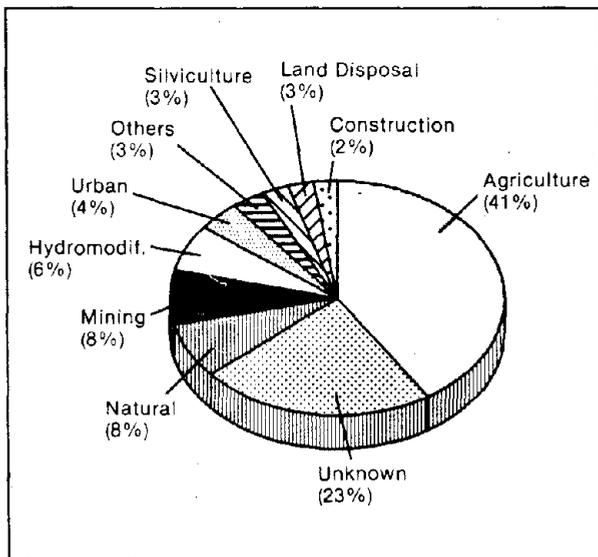


Figure 12.—Sources impacting use support in rivers.

■ Agriculture

Agriculture is the nation's largest contributor to nonpoint source pollution; states attributed 41 percent of their nonpoint source problems to this source (Fig. 12). However, if the category of sources reported as "unknown" were eliminated from the analysis, agriculture would account for more than half the nonpoint source pollution in the United States. Indeed, it is notable that, as reported in the 1988 section 305(b) report, agriculture is the leading source of water pollution in the United States, even when point source impacts are included in the analysis.

In some states, particularly in the Midwest, agriculture predominates over all other sources, causing three-quarters of the nonpoint source pollution in three states and more than half in eight other states (Fig. 13).

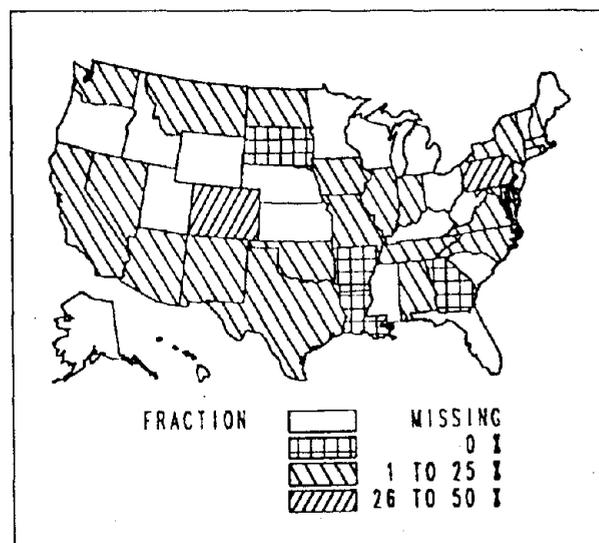


Figure 13.—Fraction of river impacts caused by agriculture.

Non-irrigated crop production and livestock comprise the two largest categories of agricultural nonpoint source pollution. Non-irrigated crops account for 36 percent. Livestock, including feedlots, animal holding or management areas, and pasturelands account for another 32 percent.

Again, these sources are significantly high in the Midwest; Wisconsin contains 35 percent of the nation's miles affected by non-irrigated cropland and 79 percent affected by feedlots. Illinois claims the most miles affected by pasture and Ohio and Arkansas have the greatest share of river problems resulting from animal holding and management areas.

Rangeland and irrigated cropland problems are significant sources of pollution in western states. In fact, 99.5 and 89 percent, respectively, of the re-

ported river mileage impacted by rangeland and irrigated cropland are found in the 11 western states reporting this information. Montana reported the greatest problem with irrigated cropland, sharing 75 percent of the problem with California, Colorado, and Wyoming. Arizona reported the largest problem with rangeland.

These assessments indicate that agriculture significantly affects the quality and usability of our nation's waters. More than a third of the river miles affected by agriculture do not support uses and another third partially support uses. Impending damage comprises the remaining third. To be successful, then, a nonpoint source program targeted at agricultural sources will probably need a balanced preventive and remedial approach.

■ Mining

Mining (coal, oil, gas, gravel, gold, etc.) is the next largest category of nonpoint sources identified by the states, although a lack of information from nine states likely resulted in an underestimation of total river mileage affected. However, some of the impacts included by states may include point source discharges from active mining operations.

Five states — Ohio, Pennsylvania, Idaho, Kentucky, and Colorado — accounted for half of the total impacts to rivers and streams. They also reported that all rivers impacted by mining were not supporting uses. Damage is particularly extensive in Pennsylvania, accounting for two-thirds of that state's total mileage affected by nonpoint sources.

Most states, however, indicated that pollution from mining accounted for less than one-quarter of their totals, and Delaware, Georgia, Massachusetts, and Vermont did not identify any mining effects.

Surface mining, subsurface mining, and petroleum activities all constituted major mining subcategories. Ohio was particularly hard hit in these areas.

Because nearly three-fourths of all rivers polluted from mining are not supporting uses, any successful nonpoint source program should involve mainly remedial efforts.

■ Hydrologic and Habitat Modification

With 6 percent of the total impacts, hydrologic and habitat modification was identified by the states as the nation's third largest contributor of nonpoint source pollution to rivers and streams. Furthermore, nearly three-fourths of the miles affected by hydrologic and habitat modification do not support uses designated by the states.

Four states — Washington, Tennessee, Idaho, and North Dakota — indicated that the problem accounts for more than 20 percent of the nonpoint source pollution to their rivers and streams. Another 22 states reported less than 20 percent and 10 others reported no significant modification problems. North Dakota, in particular, indicated a large nonpoint source problem from streambank erosion. Since much of the damage from hydrologic and habitat modification has already occurred, remedial activities are likely to be needed most.

■ Urban

Nonpoint source pollution from urban sources represents 4 percent of those impacted river miles for which sources were reported.

The extent of pollution varies from state to state. Georgia reported that all of the nonpoint source impacts to its rivers result from urban sources, and Massachusetts attributed more than half of its problems to the same cause. Rhode Island reported that one-quarter of the impacts on its rivers were from urban sources, and Virginia's 942 miles of affected rivers leads the nation at 11 percent of the national total.

Approximately 70 percent of the urban problem results from surface runoff. As with the other categories, uneven reporting by the states probably affects these urban figures. Iowa, for example, is a predominantly rural state but reported having 18 percent of the nation's urban surface runoff problem in rivers.

Nearly half of the river miles affected by urban sources do not support designated uses, while almost the same amount partially support these uses. This information indicates a need for remedial activities to correct existing problems as well as preventive measures to assure that urban growth and development do not adversely impact water quality.

■ Land Disposal

Ohio reported the greatest river mileage affected by land disposal, and Connecticut, Delaware, and Puerto Rico indicated nonpoint source pollution from land disposal caused from 25 to 50 percent of their nonpoint source impacts to rivers. Nine states said land disposal did not significantly affect river quality.

Ohio also indicated a significant problem with on-site wastewater systems, the subcategory that accounts for 72 percent of the nation's land disposal problems. These figures may overstate the significance of nonpoint source pollution, however, as some subcategories under land disposal, such as sludge application, wastewater application, and hazardous

waste disposal, can be point sources subject to permitting requirements.

Remedial activities are mostly needed to combat nonpoint source pollution from land disposal because almost 70 percent of the river miles affected do not support uses now.

■ **Silviculture**

Idaho reported more than half of its river mileage impacted by forestry activities. Led by California (19 percent) and Idaho (15 percent), 17 states said silviculture accounted for 1 to 25 percent of their nonpoint source pollution to rivers. Specifically, harvesting and road construction and maintenance contributed the greatest amount of pollution attributed to silviculture.

The absence of information from 12 states significantly distorts the figures; Alaska and Oregon, in particular, have considerable forestry activity and their inclusion would have affected the total. The fact that reporting states said that 82 percent of their impacted mileage does not support uses, underscores the need for comprehensive information.

The extent of existing impairments indicates that restoration/remedial measures should be an important component of addressing the country's silviculture nonpoint source problems. Prevention also should receive high priority in many watersheds because of the potential impact on high quality waters by activities in forested areas.

■ **Construction**

States reported construction activities as causing only 2 percent of the impacts for which sources were reported, but this low figure can be misleading. Construction overlaps with several other source categories, including urban and habitat modification. It is each state's decision as to which category to report construction problems under. The choices thus made can have a profound influence on the relative importance of construction impacts across the nation.

Since construction activities are generally completed within a few months to one or two years, any assessment of the impacts of construction activities on water quality is likely to be out of date within a year or so. It is also difficult for states to determine those waters that are threatened by future construction since development plans are needed to perform the impact analysis for each of the numerous planned construction activities. Readers should note that construction sites greater than five acres are subject to storm water permit requirements.

Idaho has reported the greatest share of the construction impacts with nearly a third of all river mileage reported. Problems from land development

and construction of highways, roads, and bridges constitute the major subcategories.

North Carolina reported the largest share of impacts caused by land development (32 percent), and Wyoming documented most of the highway, road, and bridge construction problems (58 percent). Because of the many different ways in which a state may report construction impacts, however, it should not be concluded from this information that these three states have the biggest construction problems in the nation. If all construction categories could be combined, we would likely find that other states also have comparable or greater construction problems. Given that over half of the rivers affected by this problem do not support uses and the fact that this problem stems from recurring activities, remedial and preventive measures are needed.

■ **Other Sources**

Nonpoint source pollution from natural sources represents 8 percent of those impacted miles for which sources were reported. Roughly a quarter of the rivers in the nation affected by natural sources do not support any use, while a large portion (65 percent) only partially support uses.

LAKES

About 20 percent (5.4 million acres) of the nation's lake acreage (excluding the Great Lakes, the Great Salt Lake, and Alaska's lakes) is affected by nonpoint source pollution. Slightly over 40 percent of that acreage does not support designated uses (Fig. 14). Monitoring data were used to assess 48 percent and another 48 percent was assessed through evaluation.

Support of Designated Uses

Specific uses affected by nonpoint source pollution were reported for only 4.0 million acres in 18 states. Based on this information, recreation and wildlife appear to be the most affected uses (Fig. 15).

- **Non-support:** The states reported that uses were not supported on 41 percent of the impacted acreage. Recreation was the use most affected, followed by wildlife, warm/coldwater fisheries, agriculture, and drinking water.
- **Partial Support:** Drinking water topped the list of partially supported designated uses. Recreation was next, followed by wildlife, fisheries, and agriculture.

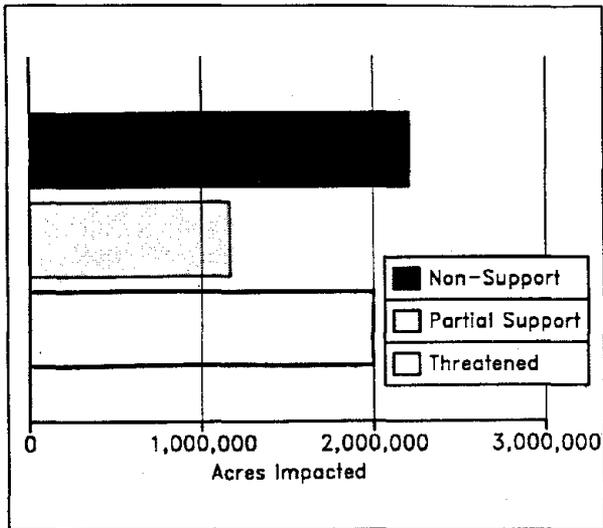


Figure 14.—Total acres impacted by nonpoint sources.

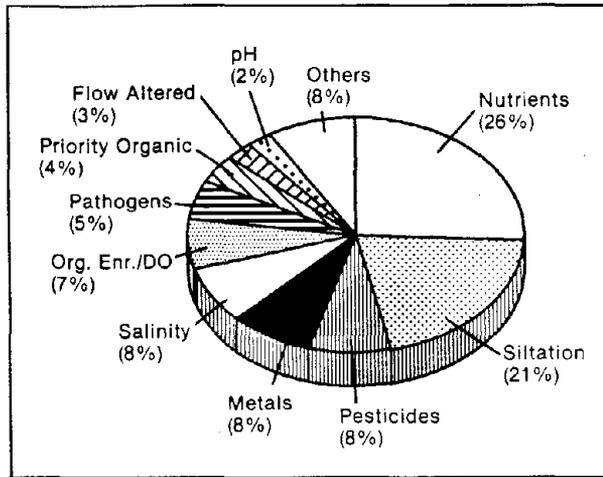


Figure 16.—Pollutants impacting use support in lakes (25 states reporting).

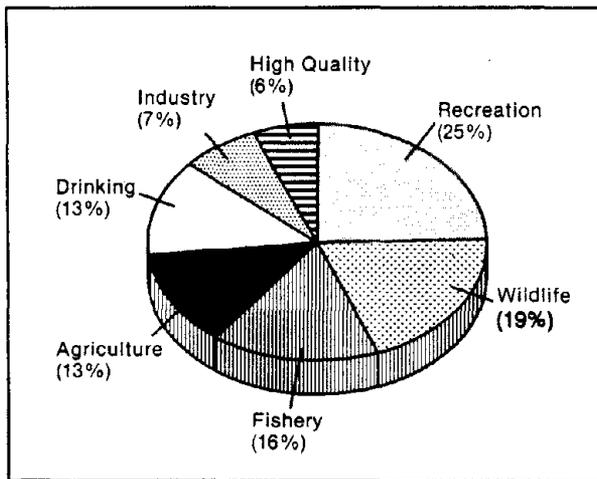


Figure 15.—Designated lake uses impacted by nonpoint sources (18 states reporting).

■ **Threatened Support:** Recreation was the major use at risk on the 37 percent of impacted average that is threatened. Wildlife was a distant second, followed by fisheries, drinking water, agriculture, and industrial uses.

Pollutants/Causes

Nutrients (primarily nitrogen and phosphorus) are the major pollutants in lakes and ponds for the 25 states reporting (Fig. 16). Siltation is the second largest pollutant, followed by pesticides, metals, salinity, dissolved oxygen, pathogens, priority organics, flow alteration, and acidity. The extent to which each pollutant affects lake water quality varies con-

siderably from state to state. For example, nutrients affect lake uses in 97 percent of Vermont's lake acres for which pollutants were reported, but affect less than 25 percent of the uses in seven other states (Fig. 17).

Approximately half of the reported siltation

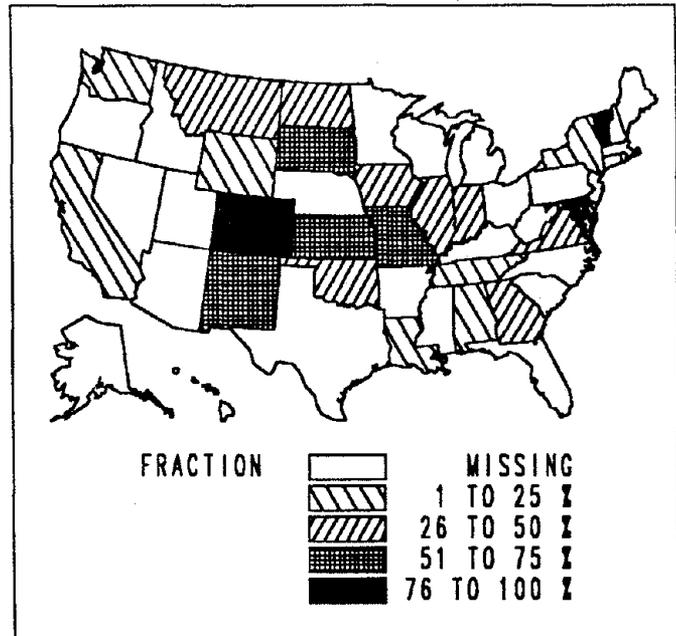


Figure 17.—Fraction of lake impacts caused by nutrients (25 states reporting).

problem is in California and Oklahoma, but the problem is clearly widespread (Fig. 18). The lack of data from states such as Minnesota, Nebraska, and Ohio has a major effect on this finding. Oklahoma reported 34 percent of all reported national pesti-

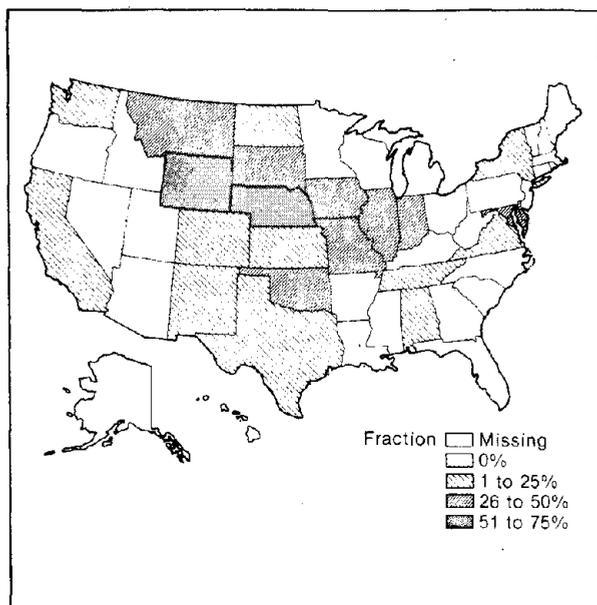


Figure 18.—Fraction of lake impacts caused by siltation (26 states reporting).

cide problems, but New York, Alabama, Kansas, and Iowa also reported significant pesticide pollution.

California accounts for more than half of the acreage reported to be impacted by metals, although Washington suffers the largest share of lake problems caused by metals.

Three-quarters of the acreage affected by salinity is found in Louisiana, with four other states identifying significant problems.

Although Louisiana accounted for 20 percent of the national total of acres impacted by dissolved oxygen, substantial dissolved oxygen problems were reported by eight other states.

California reports the greatest pathogen impacts (more than 100,000 acres). In contrast, 66 percent of Rhode Island's nonpoint source-impacted lake acreage can be attributed to pathogens, but they affect only 445 acres.

New York reported most of the acreage impacted by priority organics. In addition, seven states reported significant flow alteration problems.

Sources

Sources affecting uses were reported for nearly all the acreage reported to be affected by nonpoint source pollution. Agriculture is clearly the largest source affecting lakes (Fig. 19). Excluding natural sources, on-site wastewater systems comprise the top subcategory, however, followed by irrigated crop production, in-place contaminants, livestock, non-irrigated cropland, petroleum activities, flow regula-

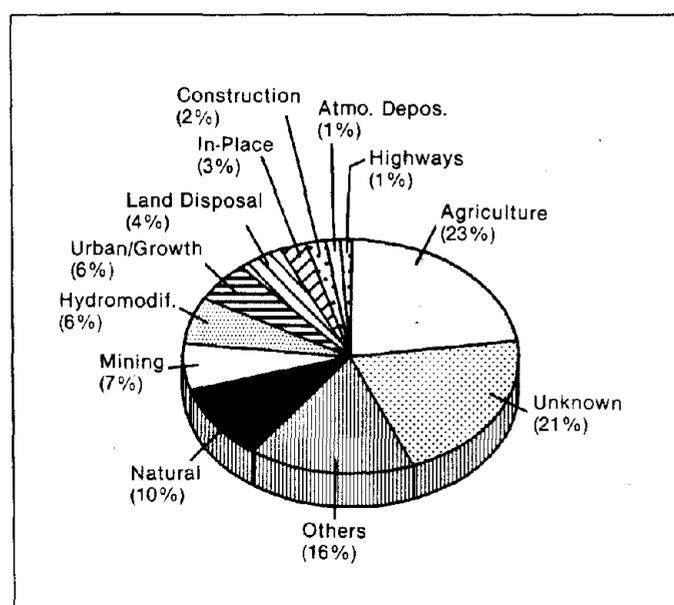


Figure 19.—Sources impacting use support in lakes.

tion/modification, streambank modification, atmospheric deposition, urban growth, highway maintenance and runoff, recreation, and urban surface runoff.

■ Agriculture

Although the largest source of nonpoint source pollution to lakes, agriculture may well affect even more than the 1 million acres reported because several states with substantial lake acreage did not supply data. Among those was Wisconsin, which, although reporting sources for only 96 acres, showed that agriculture is responsible for 61 percent of the nonpoint source damage.

Missouri reported the highest impact at 96 percent, but five other states ranged upward from 58 percent (Fig. 20). Nine other states reported that agriculture caused from 26 to 50 percent of the nonpoint source pollution in their lakes.

Irrigated crop production, the major agricultural subcategory, affects 40 percent of the acreage for which subcategories were reported. Non-irrigated crop production and livestock (pasturelands, feedlots, and animal holding areas) share the second spot. The rangeland, pastureland, and irrigated cropland problems are found primarily in the nine western states reporting this information.

More than a third of the acreage affected by agriculture does not support designated uses. An additional 30 percent partially supports uses, and 31 percent is threatened. Both prevention and remediation are indicated for most state lake management activities.

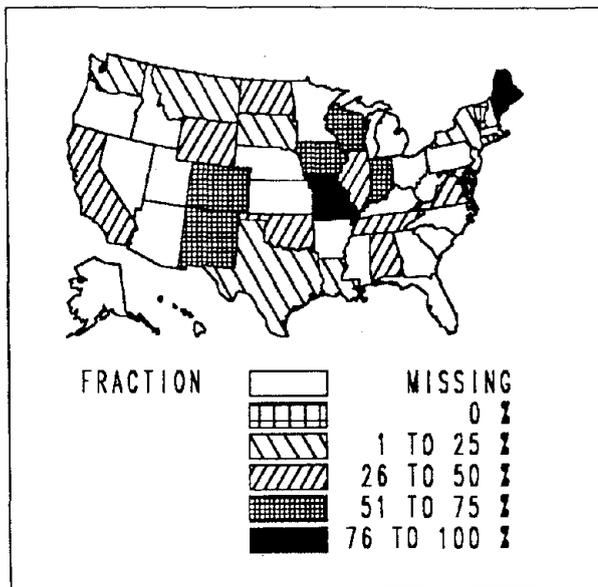


Figure 20.—Fraction of lake impacts caused by agriculture.

■ Natural Sources

About 10 percent of the acres for which sources are reported are affected by natural sources. More than a third of this acreage does not support uses and more than half partially supports uses. Fourteen percent is threatened.

■ Mining

The next largest category of nonpoint source pollution reported by the states, at about 7 percent, mining appears to mostly affect lakes in Louisiana, California, and Oklahoma, with petroleum activities a major factor. Mining causes nearly half of Washington's lake problems. As discussed previously, some of the reported mining impacts may result from point source discharges.

Surface mining and mine tailings constitute nonpoint source pollution problems for Alabama's lakes. Oklahoma also has a major surface mining problem, and two other states reported nonpoint source pollution related to surface mining.

About 26 percent of the acreage reported does not support uses, with 37 percent partially supporting uses and 38 percent threatened. A balanced program that includes both remediation and prevention could well be the key in managing mining problems.

■ Hydrologic and Habitat Modification

Although a relatively small percentage (6 percent) of national waterbody impacts stem from hydrologic and habitat modifications, these activities severely

degrade waterbody uses when they do occur. Almost half of the acreage affected by hydrologic and habitat modification does not support uses. California has the greatest acreage affected by hydrologic modification; Montana is the most affected by habitat modification. Although 12 other states reported that habitat modification caused up to a quarter of their lake problems, 10 reported none.

Flow regulation accounts for about half the effects; streambank modification or erosion and dam construction are other significant subcategories. As for most sources, a management program considering both remedial and preventive aspects is needed to address modification.

■ Urban

The full extent of the urban problem (which, as noted previously, includes both point and nonpoint source pollution) is likely to be much greater than that described in this report because of the absence of data for many states with urban areas. The fact that Iowa and Oklahoma, two states that are not highly urbanized, have significant urban problems suggests that most states are likely to have measurable urban nonpoint source impacts on their lakes.

Vermont, where urban growth is threatening lake water quality, reported the greatest acreage affected by urban sources at 21 percent of the total. Vermont's urban problem accounts for 82 percent of the state's impacted acreage for which sources are known.

California reported the second largest lake acreage affected by urban sources, all of which is not supporting uses.

Urban sources account for a large part of the lake problem in Rhode Island and Virginia, while several other states show that urban problems account for up to 25 percent of their nonpoint source lake problems. Seven, however, reported no lake problems associated with urban nonpoint sources.

Urban growth accounts for nearly half the lake problems, with surface runoff and discharge from boats the other subcategories. Expanding urban areas seem to be the primary urban threat to lakes, making land use management a key tool in addressing this problem.

■ Land Disposal

Montana reported the greatest lake acreage affected by land disposal, nearly all of it threatened. The greatest impaired acreage — none of it supporting uses — was reported by California.

Seventy percent of the reporting states found lake problems related to land disposal, which caused from a quarter to half the effects on lakes.

On-site wastewater systems (e.g., septic tanks) affected 84 percent of the acreage.

Landfills and industrial land treatment are minor contributors to the land disposal problem. Alabama and Oklahoma reported most of the lake acreage affected by nonpoint source pollution from landfills, and nearly all the lake acreage affected by industrial land treatment was reported by Tennessee. With 42 percent of the reported acres threatened, prevention must play a major role in managing this pollution source.

■ Construction

Although identified by this report as only 2 percent of the lake problem, construction is likely to exercise a much greater effect because several states are not included in this analysis.

For example, Vermont was among the eight states claiming no significant construction problems, yet Vermont reported major effects from urban growth, which is always associated with construction. In addition, other source categories (e.g., habitat modification) also have associated construction impacts, so the overall significance of construction is likely underestimated and characterized inadequately using the data provided by the states.

Wyoming and California reported the most lake acres affected by construction, with nearly all the impacts reported from road construction appearing in Wyoming. It is likely that similar impacts occur elsewhere but have not been reported by other states. Tennessee reported the most acreage affected by land development, the major subcategory of construction.

More than a third of the lake acres affected by construction do not support uses, with another 16 percent partially supporting uses and 47 percent threatened. Prevention appears to be the major need in states such as Wyoming, Tennessee, and Oklahoma, where significant threats exist.

■ Silviculture

Nearly all the lake acreage reported to be affected by silviculture lies west of the Mississippi River. Data for such key states as Alaska, Oregon, and about half of the eastern states were not available for this analysis. Given this limitation in available data, Oklahoma accounted for well over half the affected acreage, with California second at 42 percent.

Road construction and harvesting were two major subcategories.

Nearly half the acres affected by silviculture do not support uses; for example, all of California's impacted acreage is non-supportive. An additional 18 percent partially support uses, and 36 percent are

threatened. Although prevention should be a major thrust, many states will need to give remediation priority.

GREAT LAKES

Only New York and Indiana provided quantitative assessments of the nonpoint source impacts to the Great Lakes. Indiana reported impacts to 241 square miles and New York claimed 3,568 square miles affected by nonpoint sources.

Support of Designated Uses

- **Non-support.** All the affected areas reported by both Indiana and New York do not support uses, with wildlife the only use affected in Indiana, only fisheries in New York.

Pollutants/Causes

Pesticides and priority organics are each responsible for half of the nonpoint source impacts to Indiana's portion of Lake Michigan. Priority organics are the top pollutants affecting uses in New York's Great Lakes. Nutrients affect a minor segment in New York.

Sources

Indiana has not identified the sources of the pollutants impairing the use of Lake Michigan. New York, however, reported that its major sources of Great Lakes pollutants are in-place contaminants.

WETLANDS

Although several states discussed wetlands in their assessments, only three — California, Delaware, and Iowa — quantified their nonpoint source impacts to wetlands (Fig. 21). That acreage ranged from around 25,000 in California and Iowa to 850 acres in Delaware.

The absence of wetlands data for nearly the entire nation prevents EPA from drawing national conclusions regarding either the extent and type of the problem or the program needs. Since California, Iowa, and Delaware reflect differing regions of the country, differing land uses, and differing geographic and hydrologic factors, the information reported by these states provides a useful indication of the impacts that nonpoint source pollution may

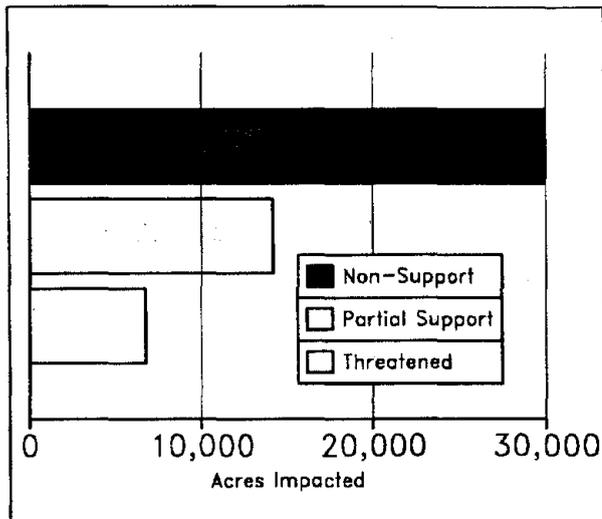


Figure 21.—Nonpoint source impacts to designated uses in the nation's wetlands (3 states reporting).

have upon wetlands in other states. Moreover, the loss of wetlands acreage and wetlands' ecological importance have been documented extensively in other national reports. It is clear from these sources and the three states' nonpoint source information that all state nonpoint source programs need to include provisions for preserving and protecting wetlands.

Support of Designated Uses

Fifty-nine percent of the acreage reported in California, Delaware, and Iowa is non-supportive, with wildlife the predominant use affected (Fig. 22). In fact, wildlife is the only use impacted in Iowa; all other affected uses are reported by California (Delaware did not report the uses affected).

- **Non-support.** All of California's and Delaware's impacted acreage, plus some of Iowa's, is non-supportive. In addition to the effects on wildlife reported by Iowa, California also reported non-support of recreation, high quality water, industry, drinking water, warm/coldwater fisheries, agriculture, shell-fishing, and navigation.
- **Partial Support.** Only Iowa reported acreage partially supported because of nonpoint source pollution.
- **Threatened Support.** Again, only Iowa reported threatened acreage.

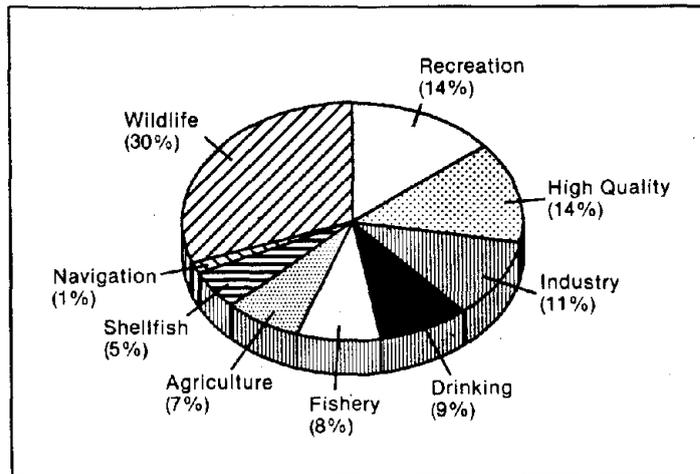


Figure 22.—Designated wetlands uses impacted by non-point sources (3 states reporting).

Pollutants/Causes

Siltation is the top nonpoint source pollutant affecting wetlands in the three reporting states (Fig. 23), with over three-quarters of those impacts reported by Iowa, where siltation accounts for nearly half the impacted acreage.

Metals, reported only by California, are the biggest problem in that state's wetlands, impairing uses on half of them. Nutrients also affect uses, primarily in Iowa, where there is partial support. But all of California's wetlands affected by nutrients do not support uses.

Pathogen contamination is a non-support problem in California, as are pesticides. Pesticide impacts on wetlands are particularly prominent in Iowa, where designated uses are largely partially supported or threatened.

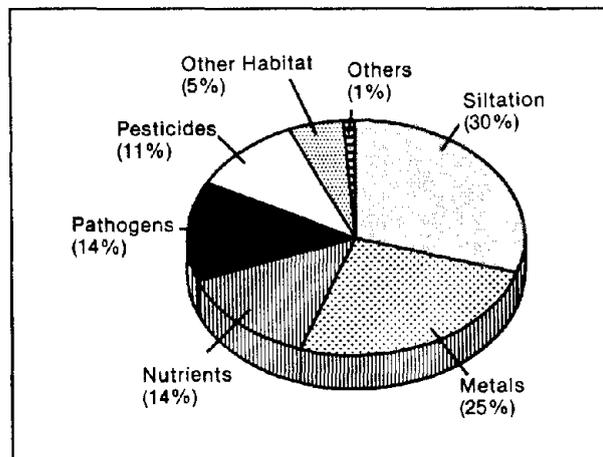


Figure 23.—Pollutants impacting use support in wetlands (3 states reporting).

The only other significant pollutant reported is habitat modification, all of it in Iowa and most of it not supporting uses.

Sources

Only California and Iowa reported the sources affecting uses. Agriculture clearly causes the greatest share of the wetlands impacts in California and Iowa (Fig. 24). The limited database provided by the states in their nonpoint source assessments does not support more detailed conclusions.

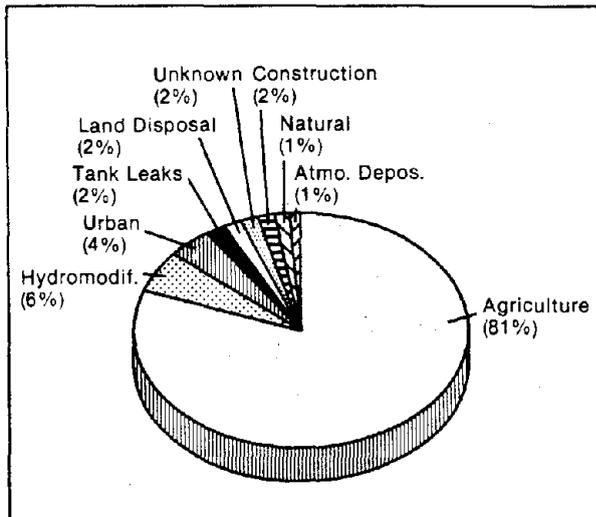


Figure 24.—Sources impacting use support in wetlands (2 states reporting).

■ Agriculture

Agriculture is by far the largest category of nonpoint source pollution affecting California's and Iowa's wetlands. Only California reported subcategories of agricultural sources, ranking animal holding and management areas first, followed by streambank erosion and irrigated crop production.

In the two states reporting, half of the acreage affected by agriculture does not support uses, including all of California's acreage.

■ Hydrologic and Habitat Modification

Hydrologic and habitat modification is the next largest category affecting wetlands, all in Iowa. Most of this acreage does not support uses.

■ Urban

Most of the urban sources were reported by California, which did not list a source subcategory for many of the impacts but attributed one third of them to discharges from boats and marinas. EPA has included the latter category under urban sources, although it might also be classified as recreational or "other."

Iowa attributed all of its urban problem to surface runoff. All of California's acreage impacted by urban sources does not support uses, while most of Iowa's partially supports uses.

■ Other Sources

Waste storage and storage tank leaks impair the uses of about 4 percent of the wetlands in California, which also reported as significant sources land disposal, construction, natural sources, and atmospheric deposition. All of the wetlands acreage impacted by these sources in California does not support uses.

COASTAL WATERS

Coastal waters are those ocean waters between the shoreline (or seaward end of estuaries) and the nation's territorial boundaries offshore. Because coastal waters data were reported in both acres and miles, EPA has combined³ the two to estimate nonpoint source impacts to somewhat more than 1.2 million acres in five states and two commonwealths (Fig. 25).

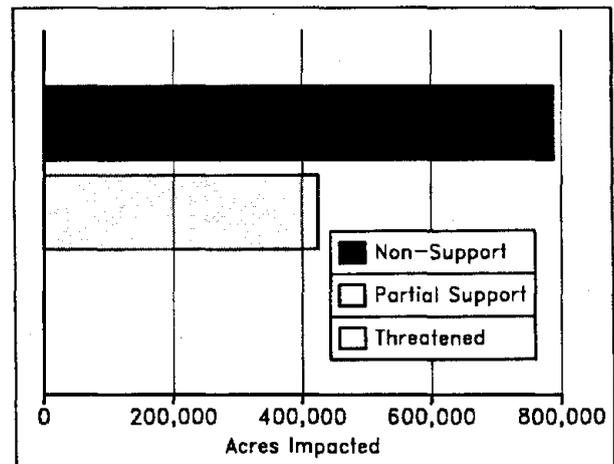


Figure 25.—Nonpoint source impacts to designated uses in the nation's coastal waters (4 states reporting).

³ EPA assumed that the impacts to each coastal mile stretched one-half mile offshore for this analysis.

Support of Designated Uses

Only four (Alabama, California, Hawaii, and New York) of the 22 coastal states reported specific uses affected (Fig. 26).

- **Non-support:** Shellfishing, recreation, high quality, industry, and navigation uses are all affected equally at the non-support level for the four states reporting. This result, however, is primarily an artifact of EPA's analysis of California's data.
- **Partial Support:** Nonpoint source pollution has caused uses to be only partially supported on about 35 percent of the coastal acres reported. Specific uses impacted were not reported.
- **Threatened Support:** No threats to coastal areas were reported by the states.

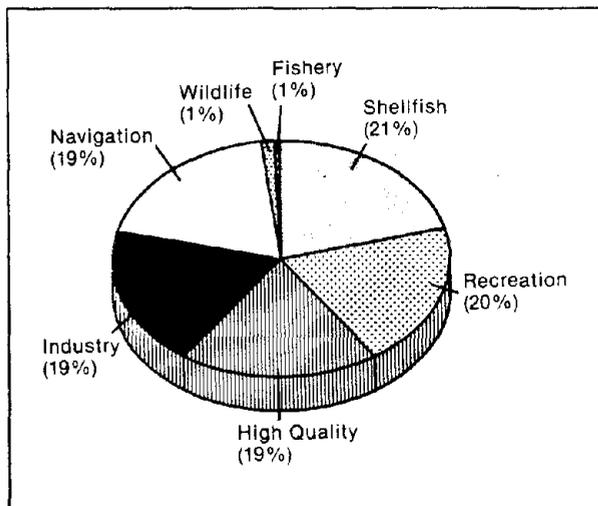


Figure 26.—Designated coastal waters uses impacted by nonpoint sources (4 states reporting).

Pollutants/Causes

Oil and grease constitute the primary pollutant affecting coastal areas in the five states reporting (Fig. 27). Metals, pesticides, other inorganics, and pathogens impact about the same amount of coastal waters, while nutrients, siltation, and dissolved oxygen problems affect much less acreage.

Sources

Waste storage and storage tank leaks cause the greatest share of coastal pollution, with mining (petroleum) next, followed by urban sources and spills

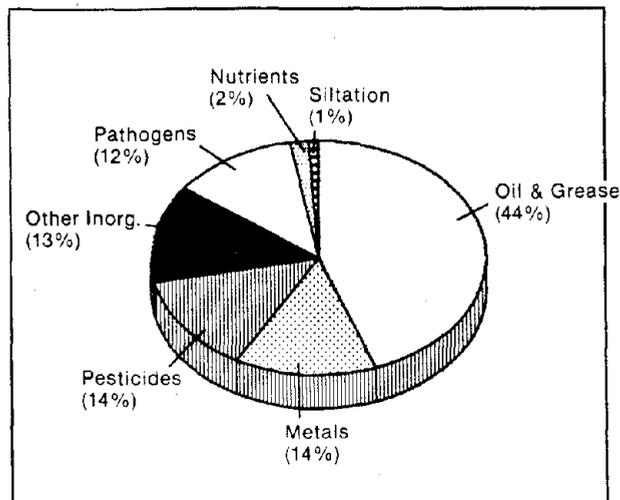


Figure 27.—Pollutants impacting use support in coastal waters (5 states reporting).

(Fig. 28). However, this cannot be interpreted as a national summary since 18 coastal states are not included in the database. The numbers presented here also may be somewhat distorted because they represent a combination of mileage and acreage reported by the four states.

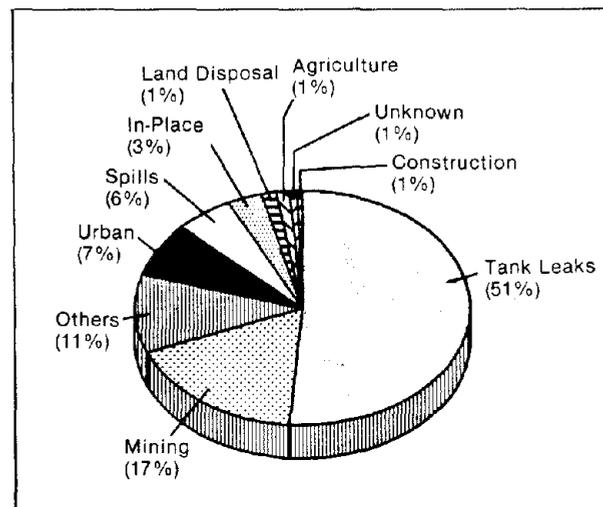


Figure 28.—Sources impacting use support in coastal waters (7 states reporting).

■ Spills, In-place Contaminants, and Tank Leaks

California blamed waste storage and storage tank leaks for nearly all of its nonpoint source impacts to coastal areas. Spills cause uses to be partially supported in 13 percent of Louisiana's impacted coastal acres; in-place contaminants cause partial support of uses on another 8 percent.

■ **Mining**

Nearly all of the coastal acreage affected by mining in the five states and two commonwealths reporting is in Louisiana.

Petroleum activities account for all of Louisiana's mining impacts of this acreage.

■ **Other Sources**

Urban sources account for 17 percent of the non-point source impacts to coastal areas in the states reporting.

Agriculture is a minor source of the reported coastal problem, with only Hawaii reporting non-support of uses because of agricultural pollution. Irrigated crop production, pastureland, and non-irrigated crop production are the major agricultural subcategories reported by Hawaii. Puerto Rico has 85 percent of the land disposal impacts in those states reporting; New York accounts for another 14 percent. All of this impacted area does not support uses.

ESTUARIES

Estuaries are those waters found between the head of tide in upstream areas and the seawater boundary downstream. This includes all of the river system under tidal influence and the region of mixing between fresh water and ocean water. Four states dominate this analysis. Thirteen states reported, Maryland (40 percent) and Louisiana (24 percent) reporting much more than the others (Fig. 29).

Because estuarine data were reported in both square miles and miles, EPA has converted the miles into square miles for the purpose of analysis.⁴

Support of Designated Uses

Wildlife, recreation, shellfishing, and fisheries are most affected by nonpoint source pollution of the nation's estuaries (Fig. 30). Industrial, navigational, high quality water, drinking water, and agricultural uses are affected to a lesser extent. Specific use information was reported for only 14 percent of the impacted area; Maryland and Louisiana are not included in this part of the analysis.

- **Non-support:** Over half of the impacted estuary area cannot support designated uses, with Maryland reporting 80 percent of the non-support area.

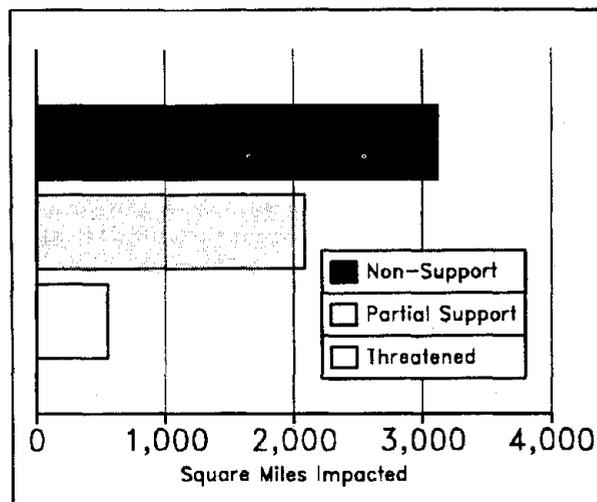


Figure 29.—Nonpoint source impacts to designated uses in the nation's coastal waters (13 states reporting).

- **Partial Support:** Nonpoint source pollution has caused uses to be only partially supported on about 36 percent of the total area. Louisiana reported the greatest area partially supporting use.
- **Threatened Support:** About 10 percent of the total estuarine area reported is threatened.

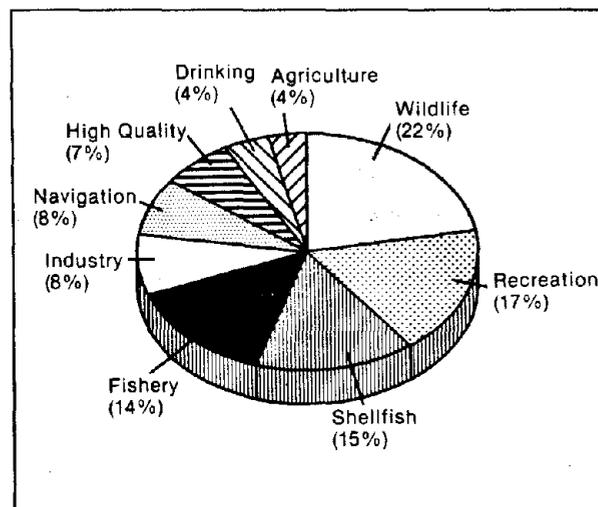


Figure 30.—Designated estuarine uses impacted by non-point sources (13 states reporting).

⁴ For this analysis, EPA assumed that the 252 miles reported by Louisiana impacted an area 1/16 mile wide (252 x 1/16 = 16 square miles). All other data were reported in square miles.

Pollutants/Causes

The following pollutant information largely reflects conditions in Maryland and Louisiana since these states account for two-thirds of the impacted area included in the analysis. Nutrients are the biggest problem for estuaries, affecting 35 percent of the impacted area reported (Fig. 31). Maryland reported the biggest share of the nutrient problem (83 percent); Louisiana and Virginia, although experiencing significant problems with nutrients, reported far fewer acres.

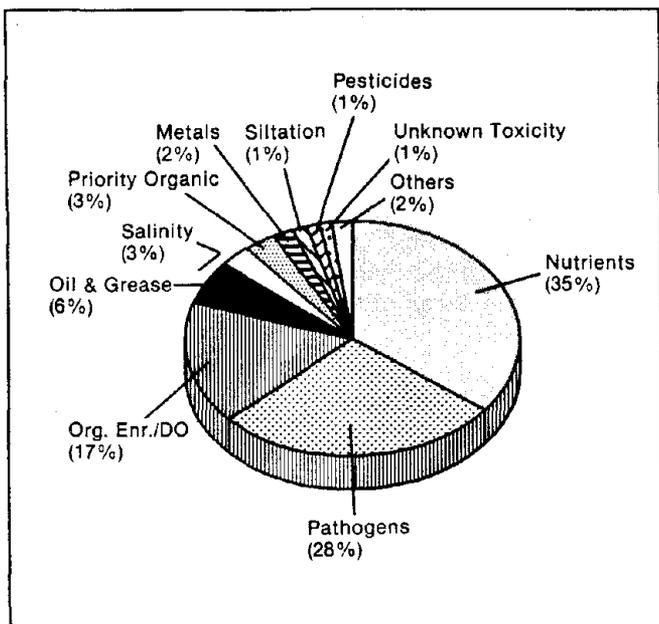


Figure 31.—Pollutants impacting use support in estuaries (11 states reporting).

All of Maryland's nutrient pollution causes non-support of uses, while most of Louisiana's nutrient pollution causes partial use support, and the greater part of Virginia's impacts threatens uses.

Pathogens cause the next greatest amount of the reported damage to estuaries. Louisiana reported the greatest area impacted, followed by Maryland and Washington. Nearly all of Louisiana's pathogen-impacted estuaries partially support uses, while all of Maryland's do not support uses, and the greater part of Washington's are threatened. Seven other states reported pathogen problems in their estuaries, ranging from 7 square miles in Alabama to 97 square miles in Virginia.

Dissolved oxygen problems rank third, with Maryland once again reporting the most area impacted. Louisiana and North Carolina also have major problems associated with oxygen imbalances.

Oil and grease, salinity, priority organics, and metals are the other pollutants causing a significant

portion of estuarine contamination. Louisiana reported most of the oil and grease contamination, with New York accounting for 90 percent of the estuary impacts caused by priority organics.

Sources

In-place contaminants, one of the "other" sources in the 305(b) classification scheme (see Table 4), are the biggest identified source of pollution to estuaries in the 13 states reporting, followed by on-site wastewater systems and petroleum activities (Fig. 32). Again, because of the large areas reported by Maryland and Louisiana, these findings are strongly influenced by these two states.

Urban sources are also significant, with surface runoff apparently the largest subcategory.

Identified agricultural impacts to estuaries seem to be largely related to livestock. Crop production was not identified as a major source of pollution to estuaries.

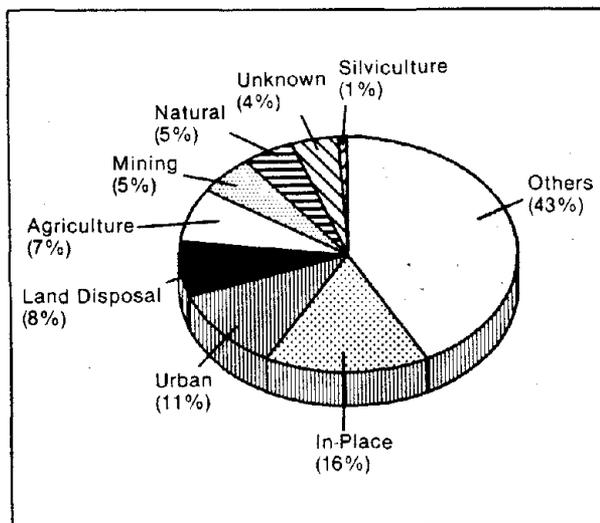


Figure 32.—Sources impacting use support in estuaries (13 states reporting).

■ In-place Contaminants

In-place contaminants affect uses on the greatest share of estuaries in those states reporting, with Maryland reporting most of the area thus impacted.

Nearly all of the area affected does not support uses. This indicates that the damage has already been done and that remedial measures will be needed to address the problem. Preventive measures, of course, will be necessary to stop the buildup of contaminated sediments and other forms of in-place contaminants.

■ Urban

Urban sources affect the second greatest portion of estuarine area. The urban problem is widespread, with Virginia and Louisiana reporting the bulk of the problem.

Slightly over half the areas impacted by urban sources partially support uses, with the remainder pretty equally split between non-support and threatened.

■ Land Disposal

Although minor in terms of overall national significance (8 percent), land disposal affects many estuaries to some degree. On-site wastewater systems are responsible for the preponderance of the reported problems, primarily in Louisiana and to a lesser degree in Washington and Texas.

In most cases, land disposal causes partial support of uses, although non-support accounts for 14 percent and another 19 percent is threatened.

■ Agriculture

Agriculture affects uses of about 7 percent of the total impacted area reported. Virginia and North Carolina both reported one-third of the agricultural impacts to estuaries. Although subcategories generally were not specified, livestock uses were the most significant subcategories reported.

Most of the estuarine area affected by agriculture either partially supports uses or is threatened. This indicates that preventive measures (e.g., improving livestock, manure, and nutrient management practices) may go a long way toward addressing the agricultural problems.

■ Mining

Resource extraction affects uses on 5 percent of the impacted estuaries reported and most of this area partially supports uses. Louisiana accounts for almost all the effects of petroleum activities on estuaries. Only Washington and Connecticut also reported mining impacts, both in minor percentages.

■ Other Sources

Natural pollution causes impacts on 5 percent of the estuaries in those states reporting. Another 42 percent of the estuarine areas are impacted by unspecified or "other" sources, 4 percent by unknown sources. Silviculture, spills, hydrologic modification, and construction all have minor impacts on estuaries in those states reporting.

GROUND WATER

Although ground-water data were not required in the assessments, nine states included this information. This report provides these data to help improve understanding of the implications of nonpoint source pollution for ground water, not as a national summary.

Support of Designated Uses

Public drinking water supplies are threatened in the four states specifying use impacts, with Maine reporting that private wells are threatened in five of six hydrologic subregions and impaired in four of six.

South Carolina claimed impairments to public drinking water supplies in three subregions. Tennessee reported that five subregions have impaired public drinking water supplies and two others have impaired industrial supplies.

Pollutants/Causes

Five states reported pollutant data, and pesticides were the most frequently reported pollutant, followed by unknown toxicity, priority organics, non-priority organics, ammonia, metals, and nitrate.

Maine topped the list of those reporting the greatest number of pesticide impacts, again followed by Tennessee and South Carolina. The Virgin Islands also reported a number of pesticide effects.

Sources

EPA's review of the state ground-water lists indicates that the states are reporting many sources that are often managed under other programs. For example, a large share of the ground-water impacts from hazardous waste sources, industrial land treatment, landfills, mining sources, and storage tank leaks that were reported in state assessment can be addressed under RCRA or Leaking Underground Storage Tank programs.

Maine reported that land disposal (wastewater, landfills, and hazardous waste), waste storage and storage tank leaks, and highway maintenance and runoff cause all of its reported ground-water impacts.

Other states, while usually including land disposal, also attributed impacts to agriculture, natural sources, spills, mining, agriculture, industrial land treatment, non-irrigated crop production, livestock, silviculture, urban sources, and storm sewers.

III. Management Programs

Section 319(m)(2) requires that EPA in its final report to Congress describe the management programs being implemented by the states to control nonpoint source pollution. To fulfill this requirement, EPA summarized and analyzed information contained in those state management programs approved as of January 4, 1990. However, the information contained in this analysis may not fully reflect the current status of state nonpoint source control programs for a number of reasons.

First, state nonpoint source programs have been evolving over time. This analysis provides only a "snapshot" of state nonpoint source program activities at the time the management program was approved. Many state management programs were approved before section 319(h) funds were appropriated; since then, a number of states have modified their management programs to broaden commitments, establish more detailed milestones, or focus priorities on particular programs or activities.

Second, in addition to the information gathered in the analysis of management programs, it is clear from the discussion of state and regional activities (see Chapter IV) that states are using a number of nonpoint source controls. However, EPA's review of the management programs and the states' own discussions of their FY 1989 activities suggest that although a number of activities are ongoing, in many states these activities were developed either locally or regionally and have not yet been knit together into a comprehensive statewide nonpoint source control program. These activities have, however, laid the groundwork for accelerated statewide implementation in many states.

For many states, section 319(b) codified an already developing program by requiring states to

prepare nonpoint source control management programs to address problems identified in their nonpoint source assessment reports. Specifically, the management programs are required to:

- Identify best management practices and measures that will be taken to reduce pollutant loadings from nonpoint sources identified in state assessment reports, taking into account the impact of these practices on ground-water quality;
- Identify programs to achieve implementation of BMPs. Nonregulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects should be included;
- Provide a schedule of annual milestones for the program, including implementing BMPs at the earliest practicable date;
- Include certification by the state attorney general that the laws of the state provide adequate authority to implement the state's management program;
- Identify sources of federal and other assistance and funding to support nonpoint source control activities and identify how such assistance will be used; and
- Identify those federal programs and projects that the state will review for consistency with the state nonpoint source management program.

Under the statute, management programs were to be submitted for EPA approval by August 4, 1988. EPA's regional offices were authorized to approve all or a portion of each state nonpoint source management program. Most states were unable to develop programs of approvable quality by the original date; therefore, EPA extended the submittal deadline to January 4, 1990.

Methodology for Analysis of State Management Programs

Data for this national summary were taken from all management programs or portions of programs approved as of January 4, 1990. Information from 52 state and territory management programs is included in this report. Management programs were not approved for Alaska or the Virgin Islands by the January 4, 1990, deadline. The Virgin Islands' management program was approved late in January 1990. Alaska's management program was approved in September 1990. The Pacific Trust Territories did not submit a management program for EPA review. Management programs from the Northern Marianas and American Samoa were not available for review even though they were fully approved by the deadline.

This report summarizes the following information:

- The extent to which the programs contained implementation milestones;
- The types of activities planned;
- Sources of state and local funding for planned implementation;
- State nonpoint source regulatory programs; and
- Federal consistency review efforts.

To compile this information, EPA developed a data coding form and a set of procedures and criteria for use in extracting and summarizing information from the management programs. (See Appendix D for a detailed summary of the methodology.) The major criteria governing the review process were:

1. Only those portions of a state management program that were approved as of January 4, 1990, were to be included in this report. For example, where only a portion of the

management program relating to agricultural nonpoint source pollution was approved by January 4, 1990, portions relating to urban, construction, and other sources are not included in this summary.

2. Implementation milestones reported in management programs were included only when they described existing or proposed state and local government activities. Information on federal agency programs, which are not within the control of state nonpoint source program agencies, is not included.

Management Program Approval and Coverage

Section 319(d) allowed EPA to approve all or a portion of state management programs. Some Regions approved only portions relating to a state's most significant nonpoint source problem (e.g., agriculture in Iowa). Of the 54 states and territories with approved management programs, 42 were fully approved, and 12 partially approved by the January 4, 1990, deadline. Table 6 summarizes those management program portions that were approved in each of the 52 states and two territories included in this analysis.

Most states developed specific program elements for each of the major nonpoint source pollutant sources identified in state nonpoint source assessments (e.g., agriculture, silviculture, and so forth). As seen in Table 6, most states addressed agricultural, urban, and construction runoff in their management programs. The management program approval status is important because only those activities related to approved portions of state management programs are eligible for funding under section 319.

Waterbodies Addressed by Management Programs

In general, most states identified existing state and local programs to control nonpoint source pollution of rivers and lakes. The majority of states also identified existing programs to control nonpoint source pollution of ground water. Few states identified programs to specifically address nonpoint source pollution of wetlands, estuaries, or coastal waters as components of their nonpoint source management programs.

Table 6.—Management program status as of January 4, 1990.

STATE/TERR.	APPROVAL STATUS	APPROVAL DATE	AGRICULTURE	SILVICULTURE	CONSTRUCTION	URBAN RUNOFF	MINING	LAND DISPOSAL	HYDROLOGICAL MODIFICATION
AL	Full	8/89	x	x	x	x	x	—	x
AK	Disapproved (4)	—	—	—	—	—	—	—	—
AZ	Full	1/90	x	x	x	x	x	x	—
AR	Partial (1)	—	x	—	—	—	—	—	—
CA	Full	1/90	x	x	—	x	x	x	x
CO	Full	12/89	x	x	x	x	x	—	—
CT	Full	6/89	x	x	x	—	—	—	x
DE	Full	10/89	x	x	x	x	—	x	x
DC	Partial	8/89	—	—	x	x	—	—	x
FL	Full	7/89	x	—	—	x	—	x	—
GA	Full	1/90	x	x	x	x	x	—	—
GU	Full	8/89	x	—	x	—	—	—	x
HI	Full	1/90	x	—	x	—	—	—	—
ID	Full	12/89	x	x	—	x	x	x	x
IL	Full	1/90	x	—	x	x	—	—	x
IN	Full	1/90	x	—	x	x	x	x	—
IA	Partial	12/89	x	—	—	—	—	—	—
KS	Full	12/89	x	—	—	x	x	x	x
KY	Full	11/89	x	x	x	x	x	x	x
LA	Partial (1)	9/89	x	—	—	x	—	x	x
ME	Full	1/90	x	x	x	x	x	x	—
MD	Partial	10/89	x	x	x	x	x	x	x
MA	Full	1/90	x	x	x	x	x	x	x
MI	Full	1/90	x	x	x	x	x	—	—
MN	Full	1/90	x	x	x	—	x	x	x
MS	Full	8/89	x	x	x	x	x	x	x
MO	Full	12/89	x	—	—	—	x	—	—
MT	Full	6/89	x	x	x	—	—	x	x
NE	Full	1/89	No specifics	—	—	—	—	—	—
NV	Full	1/90	x	x	—	x	—	x	x
NH	Full	1/90	—	—	x	x	—	x	—
NJ	Full	1/90	x	—	x	x	x	x	—
NM	Partial (1)	9/89	x	x	x	—	x	x	—
NY	Full	1/90	x	—	x	x	x	x	x
NC	Full	8/89	x	—	—	x	—	x	—
ND	Full	6/89	x	—	—	—	x	x	x
OH	Full	1/90	x	x	x	x	x	x	x
OK	Partial (1)	9/89	x	—	—	—	—	—	—
OR	Partial (2)	11/89	x	—	—	—	—	—	—
PA	Partial (2)	—	x	—	—	—	—	—	—
PR	Full	12/89	x	—	—	—	—	x	—
RI	Full	4/89	x	—	x	x	—	x	—
SC	Full	8/89	x	x	x	x	x	x	x
SD	Full	4/89	x	x	x	x	x	x	—
TN	Full	9/89	x	x	x	—	—	—	x
TX	Partial (1)	8/89	x	x	—	x	—	x	—
UT	Full	8/89	x	x	x	x	—	—	x
VT	Full	3/89	x	x	x	x	—	x	x
VI	Full (3)	1/90	x	—	x	x	—	—	—
VA	Full	8/89	x	x	x	x	—	—	—
WA	Full	10/89	x	x	—	—	—	—	—
WV	Partial	—	x	x	x	x	x	x	—
WI	Full	1/90	x	—	—	—	x	—	—
WY	Partial (2)	9/89	x	x	x	x	x	—	x
Total 54	—	—	50	29	34	35	26	30	25

1) Region 6 approved only the portions of states' management programs that relate to program implementation.
 2) Agriculture only. Only the grazing section of Wyoming's management program remains to be approved.
 3) Approved January 24, 1990.
 4) Approved September 1990.

Funding

States were required to identify sources of federal and other assistance and funding to support non-point source control activities. Although several states identified funding sources, the following caveats apply for purposes of this analysis:

- Only state and local funding sources, not federal sources, were included.
- The information on funding provided in the state management programs most likely does not reflect all, or even most, of local nonpoint source funding.

- Although this summary indicates that states have explored a range of funding alternatives, most states did not provide information on the amounts of funding available from the various sources. Thus, this analysis does not attempt to quantify state funding amounts. The fact that a state may have a number of nonpoint source funding sources may be misleading. For example, funding sources may range from a multi-million general revenue initiative dedicated to nonpoint source control to a number of permit fees, each generating less than \$10,000 annually.
- Although the types of activities that would be funded with identified revenue sources were not included in this analysis, 39 of the 52 states and territories reported having sources of state funding available for nonpoint source pollution control. Three additional states reported proposing new sources of state funding.
- As seen in Table 7, general revenues are the most common source of state funds. Permit fees are also commonly applied to a variety of activities: industrial, commercial, residential, and recreational water users or activities that might contribute to nonpoint source pollution (e.g., building and construction permits, septic tank permits, and fertilizer and pesticide fees).

Since the states were focusing on state programs and funding sources, only 14 states discussed the availability of existing local funds for nonpoint source control. At the local level, general revenues also account for the largest share of existing local funds for nonpoint source pollution control. Local permit fees and property and sales taxes have also been earmarked for nonpoint source control.

Implementation Activities

Under section 319(b)(2)(C), states were required to provide a schedule of annual milestones for nonpoint source control. The milestones are intended to serve as general program goals for the four-year implementation period. Each milestone may contain a number of nonpoint source control activities such as technical outreach, public education, and water quality monitoring. Each activity within a milestone is reported separately, but if it relates to more than one portion of the management program (e.g., to both agriculture and silviculture), the activity is reported for both programs.

Table 7.—Existing sources of nonpoint source funding identified in state management programs.*

FUNDING SOURCES	PERCENT OF EXISTING FUNDING SOURCES
General Revenues	47
Fees	26
State Revolving Fund	8
Taxes	6
Other	13

* Does not reflect the share of state nonpoint source funding that comes from these sources but only indicates the frequency of states' identification of these as funding sources.

Milestones are divided into two categories for analysis: statewide activities and watershed projects. Section 319(b)(4) provides that states shall, to the maximum extent practicable, develop and implement management programs on a watershed basis. Seventeen states and territories reported only statewide milestones, listing none for watershed projects. The remaining 35 states had milestones for both statewide activities and watershed projects; however, most milestones included only statewide activities. As seen in Figure 33, 77 percent of activities were for statewide projects while only 23 percent related to watershed projects.

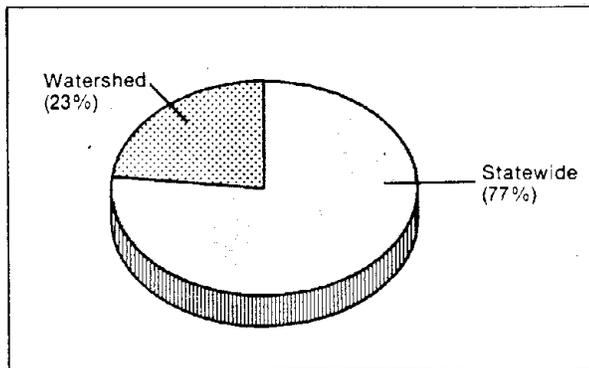


Figure 33.—Summary of state management program milestones.

Sources of Nonpoint Source Pollution Addressed by Milestones

Implementation activities were also analyzed based on the source of pollution they were designed to address. Almost a quarter of all activities reported in state implementation milestones address agricultural pollutants. Approximately one-third of the watershed project milestones address agriculture. As illustrated in Figure 34, many nonpoint source control activities are also directed to the contributions of nonpoint source pollutants by construction, urban, and land disposal practices.

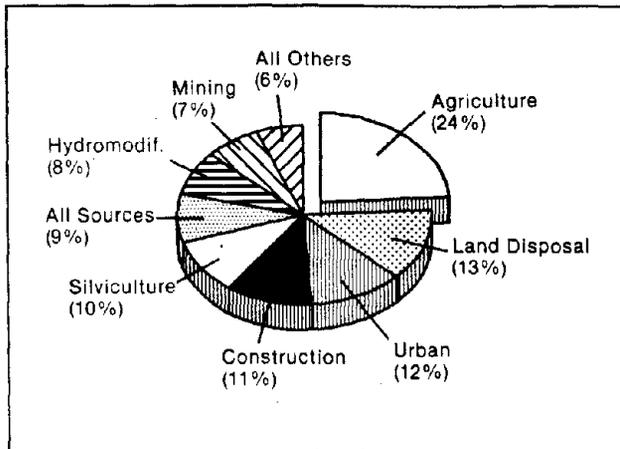


Figure 34.—Sources addressed by activities proposed in management programs.

Sources of Nonpoint Source Pollution of Ground Water Addressed by Milestones

Seventeen states have developed milestones related specifically to controlling nonpoint source pollution of ground water. Figure 35 summarizes information provided on ground-water-specific activities.

- Ground-water activities account for only 5 percent of all the activities proposed in state management programs.
- Almost 40 percent of ground-water activities were designed to address agricultural sources of pollution.
- Over 20 percent of ground-water activities relate to urban runoff.

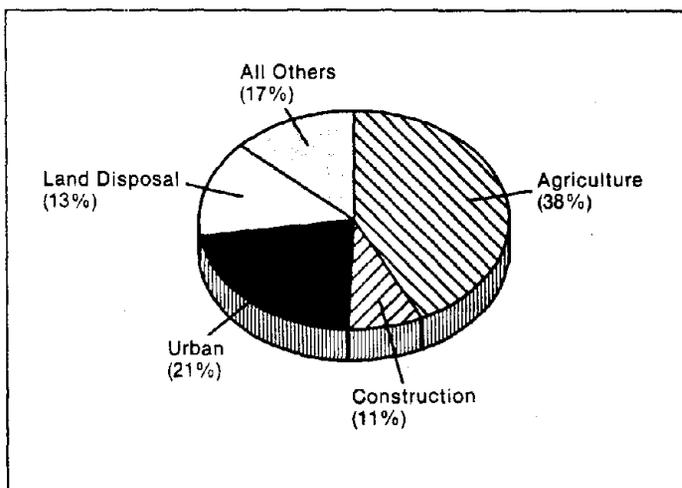


Figure 35.—Ground water nonpoint source activities (distribution by source).

Types of Implementation Activities

States proposed a number of nonpoint source control activities in their milestones; this summary groups them under the following categories: public outreach, technical assistance, technical evaluation, assessment, enforcement, reporting, implementation of nonpoint source controls (e.g., installation of structural BMPs, cost-sharing programs), and designation of priority watersheds. Figure 36 shows the distribution of types of activities in the management programs.

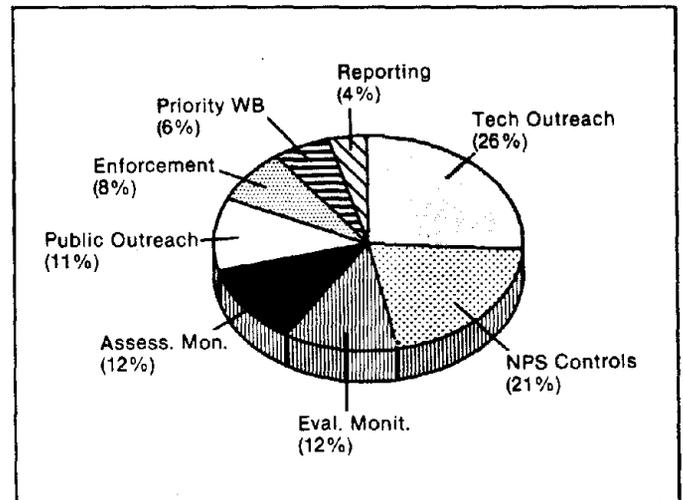


Figure 36.—Types of nonpoint source control activities contained in milestones.

- Nonpoint source control activities such as implementation of BMPs and cost-sharing programs were reported by all states. Such activities were most commonly used to address agricultural, land disposal, and urban sources.
- Public outreach activities are considered by many to be key to the long-term success of state and local nonpoint source control programs.
 - 11 percent of all activities included in state milestones related to public outreach. These activities included preparing homeowners' guides and developing school curriculum materials on nonpoint source pollution.
 - Almost a third of public outreach activities are designed to provide information on agricultural sources of nonpoint source pollution.

- **Technical outreach** is the most common activity proposed in state nonpoint source management programs, with 26 percent of all activities involving such efforts as on-site or field assistance.
- **Evaluation monitoring** is a key to measuring the success of nonpoint source control activities in meeting water quality objectives, particularly for watershed projects.
 - 39 of the 52 states reported technical evaluation as an activity for one or more components of their nonpoint source management program.
 - 12 percent of activities reported in state milestones involve monitoring. Only 11 of the 28 states with watershed-related activities proposed evaluation monitoring activities in their management programs.
- **Assessment monitoring** was proposed in a number of milestones. Many states are still trying to assess the nature and extent of nonpoint source pollution, particularly as it affects ground water.
 - Approximately 12 percent of the milestones involve assessment of surface and ground water.
 - Of ground-water-specific milestones, over 20 percent involved assessment of ground water.
- **Enforcement** activities, such as enforcement of state feedlot permits, were included as milestones in 26 of 52 state management programs. Enforcement accounted for less than 10 percent of all proposed activities and related primarily to construction and land disposal practices. Many of these practices are subject to existing state sediment and erosion control laws and solid waste regulations.
- **Reporting** requirements on both statewide and watershed implementation, such as annual reports to the state legislature, are built into a number of state management programs but account for a relatively small share of activities proposed therein.
- **Designation of priority waterbodies** allows nonpoint source control resources to be targeted to priority areas. Twenty-seven of the 52 states reported having procedures to designate priority watersheds. In some cases, the process applied only to one source of pollution.

Measures to Evaluate Nonpoint Source Management Programs

In evaluating state nonpoint source management programs, two factors were of particular importance:

- The relationship of the management program to the state's nonpoint source assessment: do milestones in the management program address the major sources of pollution?
- Are the milestones designed to allow the state to implement nonpoint source activities efficiently and effectively, as described by section 319(b)(2)(C) of the Clean Water Act?

Relationship to Assessments

Section 319(b) of the Clean Water Act links the nonpoint source pollution identified in assessment reports to the activities specified in the states' management programs. EPA has performed two simple analyses, based upon its summaries of the state management programs and assessments, to explore the linkage between approved assessments and management programs. For more detail regarding EPA's methodology and results, see Appendix E.

Program Activities Directed Toward Significant Sources Identified in Assessments

In this analysis EPA estimated whether states had milestone activities related specifically to the sources identified in its assessment as causing nonpoint source problems. Without making judgments as to the quality or scope of these activities, EPA looked for milestones for those sources that affected at least 1 percent of the impacted waters of the state.

Table 8 shows that all states identifying agriculture as a problem did address agriculture in their management programs. States also generally addressed silviculture when it was identified as a problem. Urban, hydrologic modification, mining, land disposal, and construction sources were each addressed by about three-quarters of the states claiming such nonpoint source impacts in their assessments.

Table 8.—Management program activities associated with identified problems as reported in assessments.

SOURCE	NUMBER & PERCENT OF STATES		NUMBER & PERCENT OF STATES	
	ADDRESSING SOURCE		NOT ADDRESSING SOURCE	
Agriculture	37	100%	0	0%
Silviculture	15	88%	2	12%
Urban	26	79%	7	21%
Hydromodification	19	73%	7	27%
Mining	21	72%	8	28%
Land disposal	22	71%	9	29%
Construction	17	71%	7	29%
Atmospheric	4	57%	3	43%
Highways	3	50%	3	50%
Recreation	1	20%	4	80%
In-place	2	14%	12	86%
Storage tanks	1	14%	6	86%
Natural	3	12%	22	88%
Spills	0	0%	4	100%

Note: States were given credit for addressing the source if they have at least one activity addressing the source. Source must account for at least 1 percent of surface water NPS impacts for state to be included in analysis. The numbers of states shown in this table for agriculture and urban sources are less than those shown in Figures 1-3 because the regression analyses also included states reporting that these sources accounted for less than 1 percent of the nonpoint source impacts.

The apparent strong response to agricultural problems results in large part from the presence of extensive networks and delivery systems for addressing soil conservation and agricultural resource issues. EPA did not distinguish between new and ongoing activities in this analysis, so it is likely that many of the activities associated with these seven source categories continue or expand traditional programs rather than create new programs specifically designed to address the effect of nonpoint source pollution on water quality.

In contrast to the sources previously identified, states generally do not have programs to address such sources as waste storage tanks. As noted in the chapter on assessments, storage tanks and some of the other reported nonpoint sources may be point sources and often are addressed under programs other than the nonpoint source program. States also generally have not attempted to tackle problems caused by natural sources in their nonpoint source management programs.

Correlation of Program Emphasis with Major Source Impacts Identified in Assessments

EPA used standard regression analysis to examine the extent to which management programs focused on the major nonpoint sources identified in states' assessments. The linear regression plots are provided for the interested reader in Appendix E, but are not intended as statistical proof of EPA's findings.

EPA found the strongest relationship between the states' level of activity associated with agriculture and the extent of agricultural problems, but still only 14 percent of the state variability in the emphasis on agricultural activities is accounted for by the variability in agriculture's share of nonpoint source problems.

Although weak, the agricultural correlation is fairly consistent across states and also indicates that states usually address agricultural sources even if no agricultural problems appear in their assessments. This is not surprising since, as described earlier, agricultural resource programs have long been institutionalized across the nation. These programs have begun to focus on water quality problems only recently as knowledge of the nation's nonpoint source pollution problems has become more widespread.

Another aspect of the correlation shows that state program emphasis shifts toward agriculture only slightly as agriculture's share of the nonpoint source problem increases. This can be interpreted in many ways, one being that the states all have the same core agricultural programs regardless of the extent to which agriculture affects water quality. It could also be that management programs include basically the same range of activities for each source category, reflecting priorities largely through resource allocation. EPA did not investigate these or other interpretations of the data.

EPA also found a relationship between the focus on urban activities and the extent of the urban problem. A quick look at the data, however, shows that a few states with largely urban problems are mostly responsible for this correlation. Still, however, only 11 percent of the state-to-state variability in the emphasis on urban activities is accounted for by the

state-to-state variability in the share of nonpoint source impacts caused by urban sources. The correlation also indicates that the shift toward urban activities is very slight as urban sources cause an increasing share of the nonpoint source problem across the states.

EPA did not discover statistical relationships between activities and the extent of the problem for any other source categories.

Summary

The states appear to be addressing both agricultural and urban sources where they are causing water quality problems. It is unclear, however, based upon EPA's analyses of assessment and management program data, whether state management programs have been directed similarly at other nonpoint source categories in proportion to their identified significance.

The two simple analyses conducted indicate strengths and weaknesses in states' initial attempts to establish nonpoint source programs to address identified problems. On a positive note, all states with agricultural nonpoint sources addressed such sources. However, in many states, the percentage of the program focused upon agricultural nonpoint sources was significantly higher or lower than the extent of the identified problem would indicate. Beyond agricultural sources, the match between identified problems and planned activities is, with certain exceptions (e.g., urban activities in highly urbanized states) rather weak.

There are several reasons for differences between assessments and management programs. The first is an issue of timing. Because the states were developing their assessments and management programs simultaneously, they could not know the relative importance of any given source until the entire assessment was completed. This would present some difficulties initially in tying the management program milestones directly to the assessment report findings.

Second, as recommended in EPA guidance documents (e.g., EPA, *Setting Priorities: The Key to Nonpoint Source Control* [1987]), many states chose to focus their limited resources on priority areas that were often selected for reasons other than the extent to which a particular source category caused nonpoint source problems in the state. For example, the importance of particular waterbodies, public perceptions, and the anticipated capability of achieving cleanup are all valid criteria for setting management program priorities.

EPA has worked and will continue to work with the states to develop stronger linkages between the

problems identified in the assessments and the activities funded under the management programs.

Milestones in Management Programs

In evaluating management program milestones and the ability of a state to use these milestones to effectively implement a nonpoint source program, EPA selected certain basic components as essential to nonpoint source program implementation. These are well-stated objectives or goals, specific deadlines for implementation, identification of funding needs, and empowerment of a lead agency for implementation. These components were included in EPA criteria for approving state management programs (December 1987 Nonpoint Source Guidance). To understand a state's commitment to future nonpoint source control activities, milestones are analyzed in this report to determine if these components had been included.

For purposes of this analysis, a well-stated objective would be one that clearly described an activity, set forth a goal, and included a means to quantify whether the objective had been met. For example, an objective might be to install a specific number of BMPs to reduce the effects of a particular land use on water quality or to develop targeted information and education materials to promote BMP use.

To report in this analysis that a state had set a deadline for implementation, states had to require that tasks be completed by a certain date or within a specific period. If a project was not proposed to begin until after 1992 (or four years after the passage of section 319), it was viewed as not having a deadline.

Management programs were also analyzed to determine if the state had identified a funding source for the proposed activities, as described by section 319(b)(2)(E). In most cases, states acknowledged that additional funding would be needed to carry out an activity but did not identify specific funding sources.

Successful nonpoint source implementation also depends on a state lead agency to manage the effort as well as interagency coordination among federal, state, and local agencies. Management programs were reviewed to determine if lead agencies had been identified for each milestone.

Quality of the Milestones

Of the 52 states and territories whose management programs were analyzed, 15 had milestones that

met all of the criteria. That is, their milestones contained objectives and deadlines and identified funding needs and a lead agency. Nine of these 15 states had such milestones in their management programs for both statewide and watershed projects. However, in many cases, only one portion of a state's management program contained milestones meeting all of the criteria.

Less than 10 percent of all states' milestones included all of the criteria. The majority of state management programs contained milestones that either lacked specific objectives, committed to few outputs, or had vague deadlines. Many states were also unclear in setting forth the roles and responsibilities of participating agencies and other groups in achieving milestone tasks. Congress required state management programs to provide a schedule containing annual milestones for nonpoint source program implementation; however, those very schedules and milestones may limit a state's flexibility in managing and implementing a nonpoint source control program.

Regulatory Programs

Management programs were also analyzed to determine if states had identified existing or proposed state regulatory programs to control nonpoint source pollution. Regulations were reported by the sources they were designed to control (e.g., construction, agriculture). If the regulation covered more than one source, both were reported. If the regulation covered all sources, it was reported as such. The type of pollutants addressed were analyzed as were the types of waterbodies covered (ground water, lakes, rivers). Management programs were also analyzed to determine if provisions for enforcement of regulations were included.

Forty-six states specified regulations to control nonpoint source pollutants. However, the greatest number of existing regulations cover land disposal, agricultural, and mining activities (Fig. 37). Many of these sources may be regulated as point sources under existing NPDES provisions or under state solid and hazardous waste laws. For example, 20 percent of agricultural regulations identified in state management programs applied to feedlots and animal holding areas; almost 30 percent of mining regulations applied to surface and subsurface mining (activities subject to NPDES permitting); and approximately 30 percent of regulations for land disposal activities applied to landfills and hazardous waste disposal. Thus, a large share of the regulations identified as nonpoint source regulations really were designed to address point source discharges.

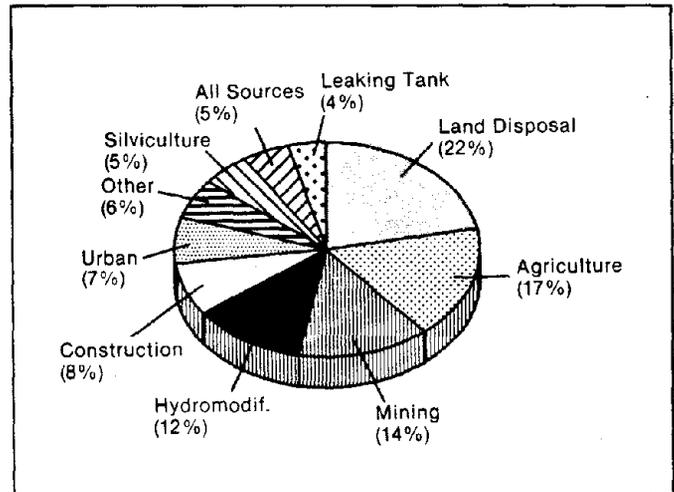


Figure 37.—National summary of existing nonpoint source regulations by source.

Management programs were also analyzed to see if states were proposing new regulatory activities. Of the total regulations described, 22 percent were identified as proposed. The majority of proposed regulations relate to agriculture, urban, land disposal, and other nonpoint sources. Twenty-three states discussed proposed nonpoint source regulatory activities in their management programs. Based on this analysis, proposed regulatory activities will increasingly focus on agricultural, urban, and other nonpoint sources such as spills, highway maintenance runoff, and atmospheric deposition (see Figure 38).

In most cases, management programs did not include information on the types of pollutants covered by the regulation or on the waterbodies subject to the regulation. For example, for 33 percent of the regulations identified in the management programs,

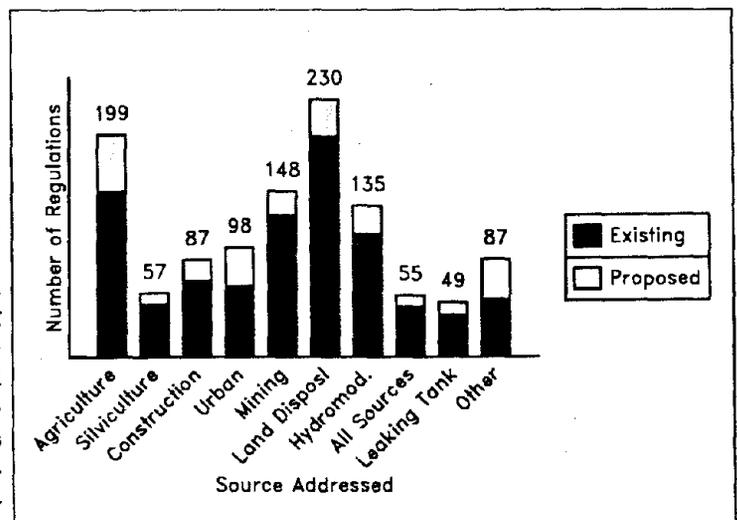


Figure 38.—National summary of existing nonpoint source regulations by source.

the type of pollutant to be regulated was either unclear or not reported. For almost half of the regulations, the type of waterbody that the regulation applied to was unclear. However, of those regulations designed to regulate specific pollutants, the pollutants most commonly covered are sediment, nutrients, pesticides, priority organics, and oil and grease. The majority of regulations applied to all surface waters or rivers. Few regulations applied specifically to lakes, wetlands, coastal areas, or estuaries.

For regulations described in management programs, over half included references to enforcement. However, in 20 of the states that identified regulatory programs, no enforcement activities were mentioned. Enforcement provisions were most common for regulating land disposal, mining, and construction. Even though enforcement activities were identified for a number of regulations, this analysis did not consider the type or extent of enforcement. It is therefore not clear what types of regulatory activities states engage in (e.g., whether they permit specific activities, adopt land use ordinances, and so on). Furthermore, it is not clear from this analysis whether states actively enforce the regulations.

Federal Consistency Reviews

Under section 319(b)(2)(F), states may review federal projects and programs for their effects on water quality to determine whether they are consistent with the objectives of the state nonpoint source management program. Forty-five of the 52 states and territories provided a list of federal projects they plan to review for consistency with their management programs.

Most states will review projects using existing intergovernmental review procedures. In addition, a number of states reported they would coordinate their nonpoint source consistency review with intergovernmental reviews provided under other statutes such as the National Environmental Policy Act and the Coastal Zone Management Act. A list of those programs states have chosen to review is provided in Appendix F.

Management Program Analysis—Summary

- State management programs appear to address the major sources of nonpoint source pollution identified in their assessments.
- Although the December 1987 guidance stressed the importance of watershed projects, 17 states reported milestones only for state-wide activities and did not include watershed project milestones in their management programs.
- In response to the requirement (section 319(b)(2)(F)) to identify funding sources for nonpoint source implementation, 39 of the 52 states and territories included in this analysis reported having existing sources of state funding for nonpoint source pollution control. The predominant funding sources were general revenues and permit/user fees.
- Section 319(b)(2)(C) required states to provide a schedule of annual milestones. A number of states reported specific milestones to address nonpoint source pollution of ground water. However, these accounted for only 5 percent of total management program milestones.
- Over a quarter of milestones addressed agricultural nonpoint source pollution. This is consistent with state assessments, which suggest that agriculture accounts for the largest share of use impairments or threats in rivers and lakes.
- Only 15 states had milestones in their management programs that included objectives, deadlines, identification of funding needs, and designation of a lead agency. These factors are critical to the success of nonpoint source program implementation.
- Although 46 states identified existing regulations to address nonpoint source pollution, many of these regulations are designed to regulate point source dischargers such as animal feedlots and mining. Many states that identified nonpoint source regulations did not describe enforcement activities.

IV. Regional Activities and State Programs

This section discusses the activities of EPA's regional offices and the state nonpoint source control programs from October 1988 through September 1989. This discussion is based on state annual reports required by section 319(h)(11) and on materials provided by EPA's regional nonpoint source coordinators. During this period, most states were still completing their nonpoint source assessments and management programs, with the assistance of the Regions.

Although section 319 grants to fund nonpoint source control projects had not been authorized during this period, some implementation did occur. In most cases, these activities involved state nonpoint source control efforts associated with other state or federal agency programs.

In November 1989, Congress appropriated \$40 million for section 319(i) and (h) grants. EPA began awarding grants the following March. These funds are being used to develop the states' institutional capabilities to execute comprehensive nonpoint source management programs and to complete specific watershed protection projects. These activities, just underway, are not included in this discussion.

REGION I

In FY 1989, EPA's Region I staff provided extensive technical assistance and guidance to states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) in developing nonpoint source assessments and management programs. However, the states were initially reluctant to develop specific four-year programs with milestones, schedules, and financing plans. The states feared that EPA would hold them to such schedules in future years, rather than view them as a means to direct the program for the future.

All states except Connecticut have used all of their 205(j)(5) allocations for nonpoint source activities. States did not identify additional needs over the four-year program period, nor did they explore alternative financing mechanisms.

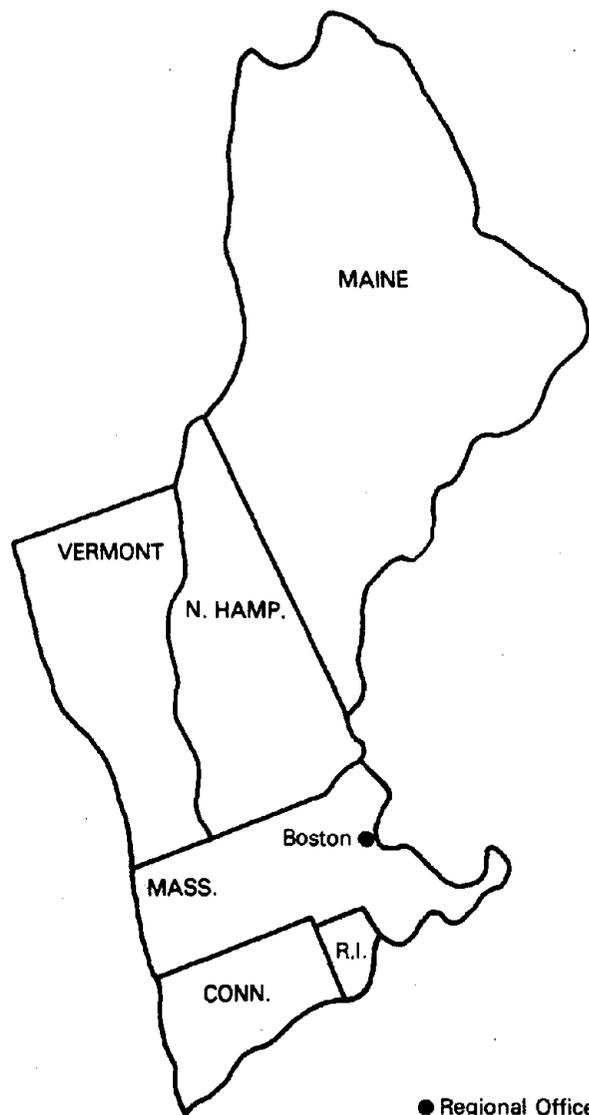
Efforts to integrate nonpoint source needs and priorities into state Clean Water Strategies and regional geographic initiatives generally were successful (e.g., near-coastal waters, Merrimack River, Cape Cod Aquifer, Lake Champlain, and wetlands).

Assessments

In preparing assessments, state lead agencies expressed frustration with the lack of (1) empirical monitoring data on nonpoint source pollution, (2) nonpoint source criteria within state water quality standards (including anti-degradation provisions), and (3) coordination with agencies responsible for wetlands, near-coastal waters, and ground water. Sustained efforts by EPA, the states, and the research community are needed here.

Region I helped the states revise their initial assessments to include more information on threatened waters, near-coastal waters, ground water, and wetlands. This improved the states' ability to identify those watersheds that need priority treatment. The revised assessments also identified use impairments or threats to lakes, estuaries, and some river segments.

The principal sources of New England's nonpoint source pollution are (1) urban runoff (including storm water); (2) erosion/sedimentation; (3) land disposal (including on-site systems, sludge disposal, and substances leached from landfills); (4) agricultural practices and animal wastes; and (5) hydrologic modification. These sources reflect the accelerated pace of land development and urbanization in the region. The impacts from development



are particularly acute along the coast, on water supply watersheds and aquifers, and in sensitive recreational lakes and headwaters.

Management Programs

In response to regional and state Clean Water Strategy priorities and assessment findings, management programs focus on near-coastal waters, water supply watersheds and aquifers, and lakes. Priorities are as follows:

- **Near-coastal Waters:** Connecticut — Long Island Sound; Rhode Island — Narragansett Bay; Massachusetts — Buzzards Bay and Massachusetts Bay, including the Merrimack River; New Hampshire—Great Bay; and Maine — Casco Bay and estuarine modeling activities;
- **Lakes:** Vermont — Lake Champlain and development of statewide lake protection regulations; and Maine—"vulnerable" lakes;
- **Water Supplies:** Massachusetts — Quabbin watershed and watersheds serving the Boston metropolitan area; and Maine — Lake Sebago and Greater Portland's water supply.

The Region assisted with management programs by encouraging states to:

- target waterbodies that needed urgent attention;
- emphasize state and local land use policies to protect existing high quality waters and prevent future pollution; and
- develop sound statewide nonpoint source programs, including (1) charting four-year action programs with milestones; (2) building broad-based interagency cooperation and public participation; (3) proposing alternative financing; and (4) developing compliance and enforcement programs.

All of the states proposed activities to control urban storm water pollution and integrate pollution prevention measures with land development. The states stress the need for statewide legislation, regulations, and guidance materials relating to land development, storm water management, and erosion/sedimentation control.

The Region also helped the states target public education programs to audiences in priority watersheds. The states proposed that project-oriented handbooks and related materials be aimed at those most responsible for the problems in priority watersheds: developers, road commissioners, and forestry-related businesses.

All Region I states have Nonpoint Source Advisory Committees that involve state, regional, and local agencies, and environmental and industrial groups. These Advisory Committees have helped to develop processes for perfecting and building consensus on BMPs and other management program efforts. Several committees have proposed generic BMPs for agriculture, silviculture, and construction.

BMPs for activities relating to storm water runoff, land development, resource extraction, and land disposal are being developed.

Initially, the states did not realize the opportunities that the federal consistency provisions offered. Now, several states cite the need for improved application of BMPs in highway projects and road maintenance; they seek EPA intervention at the regional and national level.

The states also propose that funding be provided for statewide leadership to maintain and broaden a nonpoint source program and complete specific watershed projects.

Regional Highlights

Region I has initiated several projects to enhance nonpoint source control-related programs and help accomplish geographic initiatives, including:

- A comparative demonstration of a chambered detention treatment system and a wet detention pond to control storm water runoff, a principal reason for closing Buttermilk Bay, Massachusetts, to shellfishing and recreation.
- Identification of nonpoint source impacts from specific land uses for the Near-coastal Waters Strategy, as a pilot for the National Near-coastal Waters Strategy. The project will include the development of nonpoint source control measures in estuarine management programs for Narragansett Bay, Rhode Island and Massachusetts; Long Island Sound, Connecticut and New York; Buzzards Bay, Massachusetts; and Casco Bay, Maine.
- Empirical studies of the impact of nitrogen loadings from on-site septic systems and storm water runoff into Waquoit Bay, Cape Cod, Massachusetts. The studies will assess the impact of development scenarios on estuaries, and provide a basis for regulating land use by the Cape Cod Commission to protect water quality and critical habitat. The state legislature recently gave the Commission the power to regulate land use on Cape Cod.
- The development of modeling and data management systems as local management tools to integrate water quality controls with Maine's growth management plans and ordinances. Maine's management program and 205(j)/319 grants will demonstrate implementation of water quality controls in the Lake Sebago and Casco Bay watersheds.

- An eight-year intensive monitoring and evaluation of BMPs for dairy animal wastes, milk house wastes, and farming practices in the St. Albans Bay and LaPlatte Rural Clean Water Program projects, carried out in cooperation with USDA and the University of Vermont.
- Evaluation of BMPs for reducing nonpoint source pollution in specific areas of the Merrimack River Basin. The pollution prevention efforts are part of an interstate/interagency Merrimack River Initiative led by EPA.



Candlewood Lake, Connecticut. Photo by Jonathan Simpson.

- Development of an urban runoff program for Buttermilk Bay, Massachusetts. Urban runoff poses significant water quality problems for confined estuaries and embayments because of the concentration and variety of pollutants discharging into shellfishing and recreational waters. Bacteria, nitrogen compounds, sediment, suspended solids, petroleum products, heavy metals, and toxics are pollutants causing concern. Shellfish bed closings in Buttermilk Bay prompted extensive efforts by local citizens and officials to control nonpoint source pollution in the Bay and develop a storm water infiltration system.

Citizen education was a major component of the overall watershed management strategy. Information was provided on septic system maintenance, pet control, and proper litter and household waste disposal. EPA's nonpoint source staff developed a plan for treating storm runoff from the watershed that involved modifying existing catch basin systems and installing an infiltration system to remove bacteria and other contaminants from the storm water.

These new systems have reduced runoff to the bay. Field observations suggest that the infiltration system has been highly effective in removing bacteria from the runoff.

CONNECTICUT

Statewide Activities

The state legislature passed Public Act 89-305, *An Act Concerning Designation of Aquifer Protection Areas*. This act requires that public wells in stratified drift (sand and gravel) aquifers be protected through state and municipal land use regulation in

"aquifer protection areas." The Department of Environmental Protection (DEP) will develop regulations to designate aquifer protection areas, specify land use prohibitions, and identify BMPs for land use. Municipalities, water supply utilities, and soil and water conservation districts share responsibility for program implementation.

DEP established a Farm Resource Management Plan Advisory Committee that first met in October 1989. The committee is working with SCS to develop an Agricultural Resource Management Plan Pilot Study that will evaluate BMPs for inclusion in DEP's Farm Resource Management Plan regulations. DEP's draft regulations were due for public notice in July 1990.

The Connecticut Council on Soil and Water Conservation continues to emphasize water quality enhancement through improved nonpoint source management programs, better agricultural practices under the Aquifer Area Protection Act, and enforcement of erosion and sedimentation control laws. Pollution reduction demonstration projects for Long Island Sound may be applied to the entire basin in the future.

The state is rewriting its watershed protection handbook. The handbook shows municipalities how to protect public water supply reservoirs by improving land use zoning, subdivision regulations, and land management techniques.

During FY 1990, a draft of the state's Clean Water Strategy will be available for public review. This report sets geographic priorities designed to target limited government resources on the state's most urgent water quality problems (e.g., Long Island Sound, sources of public potable water, and aquifer protection areas). It also proposes specific ways to consolidate regulatory and non-regulatory programs into an overall management approach.

Watershed Activities

The state granted ASCS an additional \$100,000 in FY 1989 to cost share agricultural BMPs. In October 1989, SCS provided financing and authorization for the *Hoosatic River Cooperative River Basin Study*. The study, which involves SCS, U.S. Forest Service, Connecticut DEP, and New York and Connecticut state and county soil and water conservation districts, will provide the basis for greater implementation of agricultural BMPs and associated cost sharing.

Four watershed protection projects were initiated in 1989 using 205(j)(5) funds to protect state reservoir systems.

MAINE

The Maine Department of Environmental Protection (DEP) developed a state nonpoint source management program with assistance from federal, state, and local agencies. Maine's Nonpoint Source Advisory Committee represents state and local agencies and industries that are directly concerned with nonpoint source management.

Maine has identified the following problems as priorities for state attention and funding:

- **Development** (including construction erosion/sedimentation, nutrients, and urban runoff)—a major priority throughout the state, with critical effects in the southern, coastal, and lake regions.
- **Agriculture** (erosion/sedimentation, animal wastes, and pesticides)—a major statewide priority.
- **Silviculture, resource extraction** (including recent mineral mining proposals).
- **Transportation, chemical use and storage, waste disposal** (including landfills and on-site systems).
- **Marine industries and hydrologic modification**, considered moderate to high priorities (in critical waters).

State program officials are concerned that the recent state budget deficit could reverse gains made in staffing over the last two years (including the hiring of a full-time nonpoint source coordinator and state water quality staff) and slow program momentum.

Statewide Activities

The DEP published *Phosphorus Control in Lake Watersheds*, a handbook that outlines methods to evaluate the phosphorus loadings in lakes and streams that result from development and changes in land use. The handbook is designed for use by state permit reviewers and local governments.

The DEP also published *The Long Lake Watershed Study—a Handbook for Long-term Lake Protection*, intended for use by lake associations and local governments as a model for integrating phosphorus control methodology with local growth management programs and ordinances. DEP helped regional planning commissions and local governments apply the methodology to vulnerable watersheds.

Proposed Activities

The Maine DEP proposes the following activities for FY 1990:

- **Casco Bay Land Use:** Work with local governments in Casco Bay to develop land use ordinances that will control population density in future development, and to implement BMPs designed to combat erosion, sedimentation, and urban runoff. Other proposed activities include conducting workshops, publishing brochures, and helping local governments and landowners combat the contributions of development, forestry, and agriculture to nonpoint source pollution.
- **Lake Sebago Pollution Prevention Project:** Provide technical assistance through the Portland Water District to help local governments within the watershed use land ordinances and BMPs to control and prevent nonpoint source pollution. The assistance is designed to protect Portland's potable water supply and recreation.
- **Kennebec County Nonpoint Source Targeted Lake Watershed Project:** Develop BMPs for the China Lake watershed; help local governments develop and adopt ordinances regarding land use and BMPs; monitor and enforce BMP compliance.
- **Rule and Regulation Development:** Develop and implement the rules and regulations needed for resource extraction, transportation, chemical use, and storage for new mineral mining activities.

- **Forestry BMP Implementation:** Develop incentives; strengthen agency regulations and local ordinances; and intensify enforcement in targeted watersheds.
- **Nitrate Pollution from Subsurface Disposal:** Measure nitrates in wells in 26 watersheds without sewer systems and evaluate the effectiveness of current regulations that affect subsurface wastewater.
- **BMP Performance Evaluation:** Evaluate changes in nonpoint source pollutants following BMP installation in China Lake, Sebago Lake, and Casco Bay.

Comprehensive Planning and Land Use Regulation Act

Nonpoint source pollution in the form of urban runoff and land development is a major cause of water use impairment in the northeastern United States. Development impacts are particularly severe for coastal waters, for surface and ground-water drinking water supplies, and for sensitive recreational waters.

To mitigate the impacts of development on water and other resources, Maine adopted the Comprehensive Planning and Land Use Regulation Act of 1988. The law established a three-tiered schedule (deadlines in 1991, 1993, and 1996) for compliance by all towns. The towns with the highest percentage growth rate are required to complete and submit comprehensive plans for their towns by the earlier deadlines. These towns are just beginning to develop their plans. Supporting land use ordinances are required within five years after state approval of the comprehensive plans.

The act has two major components that support local development of comprehensive growth management plans: state goals for growth management and state-sponsored technical and financial assistance programs.

The state's growth management goals include:

- encouraging orderly growth,
- planning and financing public facilities and services,
- promoting economic growth,
- encouraging affordable housing,
- protecting water and other natural resources,
- protecting the marine industry,

- providing harbor and shore access,
- safeguarding farm and forest resources,
- preserving historical and archaeological resources, and
- protecting outdoor recreation opportunities.

Technical assistance is provided by both state and county governments. Local soil and water conservation districts are now working with the Maine Department of Environmental Protection to deliver direct technical assistance to implement nonpoint source controls in high growth communities associated with waterbodies either impacted or threatened by nonpoint source pollution. According to DEP staff, "towns are generally hungry for any technical assistance we can provide and every effort is made to respond to requests for help in a timely manner."

Maine's program has been successful, in part because of the substantial state financial commitment (approximately \$1 million per year) and technical assistance provided to towns that are developing and implementing plans. The state feels that this level of support is necessary and that money and staff time are well spent when compared to the cost of restoring even one waterbody. Maine is placing a great deal of emphasis on the growth management process as a means to control the state's nonpoint source pollution problem.

Maine's nonpoint source program recognizes that the act and subsequent local planning provide a tremendous opportunity to institutionalize the nonpoint source control program at the local level. Nonpoint source program activities to support the Comprehensive Planning Act include:

- close liaison with the Office of Comprehensive Planning within the Department of Economic and Community Development (the office that administers the growth management program);
- developing nonpoint source control model ordinances;
- assisting with development, review, and comment on municipal comprehensive plans and ordinances;
- training Code Enforcement Officers through vocational and technical education schools; and
- emphasizing pollution prevention and the economic benefits associated with improvements or protection of water quality.

Watershed Activities

Maine initiated several projects that addressed specific water quality problems in watersheds, including:

- Demonstration of innovative sediment/nutrient control ponds in agricultural watersheds in Aroostook County. The ponds are being monitored by the University of Maine, with preliminary results indicating phosphorus loadings have declined by more than 85 percent.
- Completion of an inventory of farmland in priority agricultural watersheds and outlining of the BMPs needed in these areas.
- Development of BMPs for water quality protection to be included in regulations that implement the Forestry Practices Act.
- Preparation of *Maine's Marine Environment Plan for Action* and *Agenda for Action — Casco Bay* for the Region I Near-coastal Waters Strategy. The strategies address how storm water runoff, erosion/sedimentation, on-site waste systems, and agriculture may contribute toxins to marine sediments.
- Increased technical assistance and monitoring to help high growth areas adopt plans and ordinances to protect aquifers and wellheads.

MASSACHUSETTS

Statewide Activities

The state published *Best Management Practices, Timber Harvesting Handbook* in April 1989. The booklet addresses timber activities near lakes, ponds, small streams, and wetlands. In addition, a nonpoint source best management practices manual is being developed to address the application of BMPs to agriculture, silviculture, construction, urban runoff, resource extraction, and land disposal.

The state legislature is considering a proposed Soil Erosion and Sedimentation Control Act. The bill addresses the effects of agriculture, silviculture, construction, resource extraction, and hydrologic modification on lakes, ponds, small streams, and wetlands.

Open space acquisition to control water quality continue in the Department of Environmental Pro-

tection, the Department of Fisheries, Wildlife, and Environmental Law Enforcement, and the Metropolitan District Commission. However, fiscal constraints will limit future efforts.

The state continues to develop and present seminars on regulations affecting septic tank design and construction. These regulations are designed to ensure that septic tanks do not adversely affect the water quality of ground water, lakes, ponds, and small streams. Although the DEP did not engage in federal consistency reviews under section 319 during FY 1989, the state's Coastal Zone Management Agency is continuing its state Environmental Policy Act reviews, focusing on all categories of pollution that occur along the state's coastline.

Fiscal concerns also are likely to prevent the passage of legislation that would establish a state-funded nonpoint source pollution control program, even though the bill has wide support on technical grounds.

Watershed Activities

The Quabbin Reservoir watershed is one of the largest (186 square miles) bodies of untreated drinking water in the world. Unless nonpoint source pollutants entering the system are controlled, Safe Drinking Water Act regulations may force the installation of an expensive water filtration system. Nutrients, metals, bacteria, and other chemicals in the tributaries are being monitored bi-weekly; those in the lake are monitored monthly. This monitoring effort is the first step in developing a detailed nonpoint source watershed management plan.

The contamination of shellfish beds from urban runoff, land disposal, and agriculture greatly concerns local, state, and federal officials. The state is conducting a nonpoint source control demonstration project on the Back River in Bourne and on Snell Creek in Westport. Detailed management plans are being developed to control excessive fecal coliform and nutrient levels in each of these 1,000-acre watersheds. Using the demonstration areas as models, an overall guidance document will be prepared to help municipal officials address similar problems.

The Clean Lakes Program administered 36 diagnostic/feasibility studies, 35 implementation/maintenance projects, and 10 lake restoration projects this past year. However, a shortage of state funds and the reassignment of personnel will slow this program for the foreseeable future.

Federal assistance allowed completion of the Buzzards Bay project, including the construction of a storm water facility in Bourne along the Bay. Workshops have discussed management problems, needed improvements, and cost impacts related to the projects.

The Southeastern Regional Planning and Economic Development District completed and published three reports: *The Technical Resource Manual*, *Sample By-Laws*, and *An Assessment of Past Implementation of Local Water Quality Recommendations*.

The SCS has been working closely with the state on the Pontoosuc Lake project, the Metcalf & Eddy shellfish project, and agricultural demonstration projects. SCS also has worked to establish a liaison position to work full-time with state staff, and has recommended increased funding for the Clean Lakes Program.

Funding Summary

The Nonpoint Source Pollution Control Program received federal funds through section 205(j)(5) (\$393,062 in FY 1987 and \$100,000 in FY 1988). These funds enabled the state to develop the state assessment report and management program, and to conduct special projects. These projects included assessing the water quality of the Quabbin Reservoir watershed and of small streams and wetlands, and entering and verifying data in the Geographical Information System (GIS).

NEW HAMPSHIRE

Statewide Activities

During FY 1989, New Hampshire completed a statewide assessment of residuals and reported its findings in *Sludge and Septage Management in New Hampshire: A Report and Action Plan, March 1989, SR #64*. Proposed state legislation would shift lead agency authority from the Waste Management Division to the Water Supply & Pollution Control Division within the Department of Environmental Services (DES).

The state also implemented a fee system under authority of RSA 149:8-a to substitute state for federal funding of the Sediment & Erosion Control program.

The New Hampshire Fish & Game Department, Department of Public Health Services, and DES completed the *Interagency Report On the Shellfish Waters Of New Hampshire*. The report addresses problems, including nonpoint source pollution, in the Great Bay/Little Bay, Rye Harbor, and Hampton Harbor estuaries and outlines specific actions needed to re-open closed shellfish beds.

The New Hampshire legislature drafted a Comprehensive Shoreland Protection Act to address the

need for further restrictions on development in areas adjacent to public waters. This legislation has been introduced for the 1990 session.

The Ground-water Protection Bureau (in cooperation with other divisions of DES and other state agencies) developed strategies for ground-water and wellhead protection as part of the state Clean Water Strategy.

The DES, the Office of State Planning Coastal Zone Management Program, the Sea Grant Program at the University of New Hampshire, and local groups such as the Great Bay Conservation Trust, cooperated to develop initiatives to protect near-coastal waters. The designation of the Great Bay National Estuarine Reserve is a major step toward protecting this sensitive resource.

The state legislature allocated \$18 million for the Land Conservation Investment Program for 1989 and 1990. New Hampshire was able to purchase conservation easements in several significant sensitive parcels (e.g., the Nash Stream tract in northern New Hampshire) by using these funds along with matching funds from the Society for the Protection of New Hampshire Forests and other interested groups. Since the program started in 1987, several hundred tracts (70,000 acres) have been purchased. These acquisitions complement efforts of local land conservation groups and commissions that have been working for years to protect the state's natural assets from the pressures of population growth.

The Commissioner of DES appointed a full-time enforcement coordinator to address nonpoint source management issues, including subsurface disposal, sediment and erosion control, landfill, and wetlands violations. Increased public awareness and understanding of nonpoint source management goals are expected to encourage more effective enforcement.

Watershed Activities

The Office of State Planning supports regional planning agencies in developing and implementing water resource protection plans and measures at the community level. DES also provides 205(j)(1) funds to these agencies.

New Hampshire is participating in the Interstate Merrimack River Initiative to assess water quality and point and nonpoint pollution sources. The *Merrimack River Basin Water Quality Management Plan* (for New Hampshire), published in September 1989, summarizes the progress made in pollution abatement since the last update more than a decade ago.

The Office of State Planning, working with local groups, continued progress on the Merrimack River Corridor Study. The study focuses on the upper Mer-

rimack River from Franklin to Bow. Recommendations have been drafted regarding land use, setbacks for structures, and certain related activities. These recommendations emphasize the need to protect aesthetic values as well as water quality.

The state continued work under a Clean Lakes Program grant to establish baseline conditions at Mendums Pond in Lee to monitor the impact of a proposed development on water quality. These data will help expand a watershed/lake development impacts model for application to other sensitive waterbodies.

Forty-four new manure storage facilities were constructed in FY 1989 to provide better management of animal waste; most were located in Grafton (20) and Sullivan (6) counties. ASCS and local farmers shared the cost. By reducing the runoff from nutrients and bacteria, these facilities improve water quality at the same time they help farmers save fertilizer costs. ASCS contributed \$608,000 for sharing construction costs, improving solid cover, and developing erosion-resistant roadways in forests. A total of 21,930 acres were treated in the state's 10 counties.

The state has funded two new water quality coordinators based in Durham, one with the University of New Hampshire Cooperative Extension Service and the other with the Soil Conservation Service. Through their efforts, the Great Bay Area has been designated as a critical state watershed; that designation will allow the coordinators to focus on nonpoint source problems there. The coordinators also will provide technical assistance and educational programs for DES, other resource agencies, and landowners throughout the state and develop BMPs for nonpoint source management.

Water Quality Improvements

Nonpoint source controls, such as BMPs to reduce erosion, often clearly reduce turbidity; however, they do not measure subsequent effects on the waterbody. Very little monitoring data are available to measure what happens in the waterbody, especially during storms, so that reductions in nonpoint source loads resulting from BMPs and enforcement have not been documented.

Further Actions/Programs Needed

To effectively assess progress in attaining Clean Water Act goals and achieve full attainment of legislated water classifications and quality standards, baseline water quality conditions must be established. These should include not only chemical and

traditional biological parameters but also biomonitoring and sediment/substrate analysis. In addition, the basic monitoring program needs to be expanded to include storm and runoff event sampling. EPA funding is needed for this effort; a focus only on implementation will not document the effectiveness of measures taken.

Funding Summary

During calendar year 1989, New Hampshire was awarded EPA 205(j)(5) nonpoint source grants in the amount of \$268,056, using FY 1987 and 1988 funds. Less than \$125,000 of this amount actually was expended during 1989; the remainder has been carried forward to FY 1990. The main focus of the work plan was production of a final nonpoint source assessment and management program. In addition to these efforts, EPA funds supported development of a *Draft Erosion Control/Storm Water Management Manual* targeted to designers, engineers, surveyors, contractors, and town officials. Workshops were conducted to address the effects of timber harvesting practices on wetlands and water quality. The workshop audiences included landowners, loggers, and foresters. The final manual was to be completed by April 1990.

RHODE ISLAND

Statewide Activities

Rhode Island's nonpoint source management program emphasizes prevention. The program focuses on strengthening state and local programs that benefit the entire state and on programs that are models for other areas within the state. The program is designed to maximize the limited state and federal funds available for nonpoint source management.

Significant data gaps were identified in preparing the state's assessment report, and the Rhode Island Department of Environmental Management (RIDEM) is collecting additional water quality and pollution source data. All surface waters identified as high priorities for water quality monitoring data have been sampled through contracts with the U.S. Geological Survey. In addition, Clean Lakes Program funds are making possible the collection of data on lakes and ponds in southern Rhode Island.

With support from the nonpoint source pollution management program, the University of Rhode Island has developed a short course in lake management for citizens and local government officials. The course covers basic physical, chemical, and biologi-

cal characteristics of Rhode Island ponds; the interpretation of water quality data; identification of pollution sources (emphasis on nonpoint source pollution); determination of the causes of water quality problems; and methods to protect water quality. The course complements the volunteer water quality monitoring component of the state's Watershed Watch program.

An amendment to RIDEM's section 319 work plan outlines the development of a curriculum regarding state and local environmental laws and selected nonpoint source pollution issues. The material is intended for local planning and zoning board members and conservation commission members. Because of the late date of the grant award, this activity will be carried over into FY 1990.

The state started a land use planning and water quality technical assistance program for municipalities. For example, the program helped the town of Smithfield revise the nutrient loading provision of its subdivision ordinance.

The state also developed a simple phosphorus-trophic status model as a planning tool for management of surface water supply watersheds; it prepared a brief user's guide and diskette with the model and made them available to town planners and water suppliers. In addition, the state made several public presentations at conferences, workshops, and annual meetings on the topic of land use/water quality and nonpoint source pollution.

The state revised its *Soil Erosion and Sediment Control Handbook*, which will be printed in FY 1990. The Rhode Island Resource Conservation and Development Council (RC&D) is distributing the handbooks at cost.

The Coastal Resources Management Council has started a special area management plan for the lower Pawcatuck River. RC&D drafted a brochure for local officials and citizens that describes the need to adopt a model soil erosion and sediment control ordinance. As a pilot project, Rhode Island's three conservation districts have funded site plan reviews that help communities review soil erosion and sediment controls and storm water management plans and guide them in inspecting sites to determine compliance with local permit requirements. As a result of this work, two more communities have adopted the model ordinance for soil erosion and sediment control.

In response to a Coastal Resources Management Council requirement, several communities have adopted harbor management plans and others are developing them, assisted by the Council and the Coastal Resources Center. The RIDEM Division of Water Resources reviews the plans to ensure that they adequately address water quality issues and problems.

Narragansett Bay Project investigators are developing land use models for water quality and buffer areas for use by state and local planners and regulators. Water quality and wildlife habitat data needed for the buffer model are being collected in the Hunt River watershed, where the model will be tested.

The nonpoint source program coordinator has met with Rhode Island Department of Transportation representatives to discuss the protection of environmentally sensitive areas and long-term water quality protection. Of particular concern are the design, location, and construction of highways, including upgrades. An important part of the protection effort is the identification of inconsistencies between transportation needs and environmental protection standards. This substantial task has national significance.

The RC&D, with funding from RIDEM, organized Environmental Review Teams to provide expert technical advice to several Rhode Island communities on subdivision proposals and their effects on surface and ground-water quality. Assistance has been provided to the towns of Hopkinton, Lincoln, Foster, and Exeter. Review Teams also have advised several Rhode Island communities on the reclamation of sand and gravel extraction sites and provided assistance to North Kingstown and Charlestown.

Watershed Activities

- **Land Management Project (LMP):** Through these demonstration projects, public and private sector leaders are being encouraged to demonstrate innovative approaches to nonpoint source management. Specifically, the LMP is seeking to establish projects to:
 - Demonstrate nonpoint source management at a proposed subdivision development located on an abandoned sand and gravel site in a coastal pond watershed;
 - Create wetlands that will manage storm water runoff draining into the Pettaquamscutt River from a construction site; and
 - Demonstrate the use of oil and water separators retrofitted with oil-absorbing devices.

The LMP is initiating pilot watershed management programs for the towns of Warwick, East Greenwich, and North Kingstown. Based on specific planning and resource protection ob-

jectives, these programs are designed to build on the working relationship developed during the tri-town wellhead study. The programs' goal is to establish a cohesive approach to protecting ground and surface waters.

The LMP has prepared several fact sheets on land use/water quality issues and has proposed workshops to address these issues and the comprehensive planning process. The nonpoint source program has reviewed the fact sheets and discussions of workshop topics.

■ **Scituate Reservoir Watershed Project:**

The nonpoint source pollution assessment report identified this watershed as threatened by nutrients, solids, pathogens, dissolved salts, and oil and grease from:

- construction activities in the watershed;
- urbanization (predominately from increases in the impervious area and the number of individual sewage disposal systems);
- road de-icing practices; and
- agricultural activities.

A draft watershed management plan was presented to the Scituate Reservoir Task Force in the fall of 1989. Upon approval of the plan by the Task Force, towns in the watershed are expected to begin implementation. However, progress has already been made with the following activities:

- GIS maps and statistical information have been made ready for use in the Scituate Reservoir Watershed Management Plan with financial support from RIDEM.
- Environmental Data Center staff have prepared a poster illustrating limitations to further development in the Scituate Reservoir watershed.
- Correlations between certain pollutants and particular land uses have been demonstrated by preliminary results of water quality monitoring and modelling of the Scituate Reservoir watershed system.
- The Northern Conservation District and Soil Conservation District have been helping farmers in the watershed prepare and implement resource management and agricultural waste management plans.

Use of Grants

In April 1989, the Rhode Island Department of Environmental Management received a grant of \$27,000 in 205(j)5 funds to refine the nonpoint source assessment. These funds supported water quality monitoring by USGS and the University of Rhode Island's Watershed Watch program. These activities did not require state matches.

Federal funds totalling \$192,830 were granted to RIDEM in FY 1989; these funds required a state match of \$128,533 for a total budget of \$321,363. State funds supported the Environmental Review Team program and local communities' efforts to comply with state comprehensive planning requirements.

The first grant (\$146,000) was awarded in May 1989. It was amended in August 1989 to provide an additional \$46,830. The latter award represented a carryover of unexpended FY 1988 section 205(j)(5) funds.

The federal funds were allocated in the following manner: \$129,800 for salaries and general program expenses; \$20,000 for printing the revised *Soil Erosion and Sediment Control Handbook*; \$8,000 for preparation of the *Site Suitability Manual*; \$35,000 to support Rhode Island's GIS.

The average annual state expenditure on nonpoint source pollution regulatory programs in fiscal years 1985 and 1986 was \$312,809. Rhode Island's FY 1989 budget was \$770,610, of which \$100,000 was used as a non-federal match for grants other than the section 319 grant.

VERMONT

Statewide Activities

Vermont's nonpoint source assessment identified agriculture as the most extensive source of nonpoint source pollution, impacting more than 500 river miles and Lake Champlain and Lake Memphremagog. Within the agriculture category, non-irrigated crop production and pastureland are the largest contributors while soil erosion, manure and fertilizer runoff are the primary problems.

The second most serious form of nonpoint source pollution identified by the state was flow regulation below hydroelectric facilities. Restoration of river flows has strong public support and consequently, this effort has been designated as a high priority for state water quality management activities.

To this end, the Vermont Citizens Advisory Committee was formed to oversee the state's Comprehensive Rivers Program. All groups with river interests are represented and work together to ensure that river management goals are balanced. The initial efforts under the program will result in the development of river basin plans for the following high priority basins: the Deerfield River, the Passumpsic River, the White River, and the Winooski River.

Minimum flows will be addressed during direct consultation with applicants for hydroelectric licensing and relicensing on the Deerfield, Passumpsic, and Winooski Rivers.

Vermont is also working to implement measures to address lake water quality, its third priority. Activities include:

- updating and improving the Model Shoreland Zoning Report;
- developing a lake protection guide on how to achieve sufficient water quality protection and management at the town, regional, and lake watershed levels; and
- distributing educational materials to municipalities, lake associations, and the general public.

The publication *Shoreland Zoning Options for Towns* will be distributed and explained to municipalities and regional planning organizations following internal review and completion. This manual may include zoning regulations for new development requiring setbacks for houses and septic systems, regulations for density of development,

requirements for vegetated buffer strips, and the establishment of erosion control standards for new construction. A contractor will prepare, with state assistance, a *Water Quality Planning and Protection Manual* for planners. Scheduled for completion and distribution by late 1990, the manual will provide information about regulatory and non-regulatory options for local lake water quality protection.

Vermont's growth management law requires that natural resource issues be addressed as part of the planning process. Most municipalities will be required to rewrite town plans and revise local land use controls. Four municipalities have requested and received more advanced technical assistance for achieving specific water quality levels for lakes. Efforts have been made to educate local communities on how incremental growth and development affect water quality. For example, comprehensive river planning and GIS mapping of wetlands provide water quality and natural resource information to communities for use in their Act 200 plans.

The Vermont Department of Environmental Conservation has directed section 205(j)(5) funds to two nonpoint source program areas:

- re-establishment of minimum flows, and
- comprehensive rivers management and lake water quality protection (including a lake water quality manual).

Vermont will use recently awarded section 319 implementation funds to enforce the state's Wetland Rules, domestic discharge requirements, and Act 250 erosion control, as well as abate nonpoint source pollution of ground water.

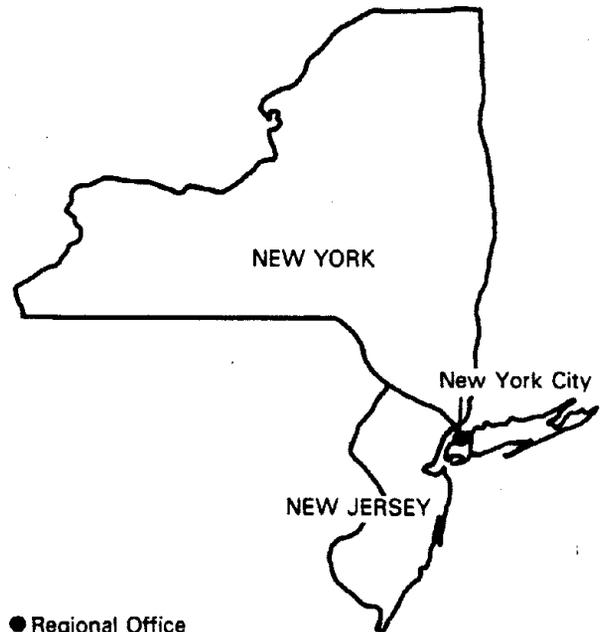


REGION II

Nonpoint source pollution is a significant source of contamination for many waterbodies in Region II (New Jersey, New York, Puerto Rico, and the U.S. Virgin Islands). In New Jersey, nonpoint source pollution is the major reason for closures of beaches and restrictions on shellfish growing in backbays and estuaries. Throughout the region, acid rain, agriculture, urban development, and underground storage tanks are the major generators of nonpoint source pollution.

Each state in the Region formed a nonpoint source task force or working group to help develop that state's assessment report and management program. The task force or working group played a major role in setting nonpoint source priorities and implementing programs.

Following are some highlights of nonpoint source activities in the states and territories comprising the Region.



NEW JERSEY

Statewide Activities

- **Soil Erosion and Sedimentation Control:** New Jersey has established a program to prevent soil erosion and sedimentation caused by new construction. Land-disturbing activities are subject to soil erosion, sedimentation, and nonpoint source pollution control requirements of local soil conservation districts, which must certify sediment and erosion control plans before construction begins.
- **Nonpoint Source Education:** The New Jersey Department of Environmental Protection is developing a nonpoint source education program that is targeted to local officials, businesses, schoolchildren, and the media. The program emphasizes topics such as good housekeeping practices to help reduce urban runoff pollutants.
- **Citizen Participation:** New Jersey Water Watch has been developed to identify local nonpoint source problems and to train citizens to monitor water quality. Presently there are 61 active Water Watch groups in New Jersey.
- **Legislative Initiatives:** Several new laws have been enacted to support the New Jersey nonpoint source program. These are the Wellhead Protection Sections adopted pursuant to the federal Safe Drinking Water Act Amendments of 1986; the Sewage Infrastructure Improvement Act; the Watershed Buffer Act; and the Aquifer Recharge Protection Act.
- **Cooperative Estuary Programs:** New Jersey has worked with the National Estuary Programs in the New York–New Jersey Harbor Estuary and the Delaware Estuary to address both point and nonpoint source pollutants through the development of a Comprehensive Conservation and Management Plan.
- **Coastal Water Quality Management Project.** This project developed a water quality and shellfish resource assessment methodology to define past and current conditions of specific estuaries.

Watershed Activities

- **Cook College Study on Watershed Protection:** This study addressed the relationship between land use and surface waters in the state. The report is expected to recommend ways to abate nonpoint source pollution, including adoption of BMPs in urban areas.
- **Navesink River Shellfish Pollution Control Project:** This continuing cooperative study addresses pollution problems in the shellfish harvesting areas of the Navesink River. Preliminary findings show that primary bacterial loading comes from animal feces and urban and suburban runoff; the report identifies appropriate BMPs to control the bacterial contamination. The latest phase of the project is a survey to evaluate storm water impacts to the Navesink River.
- **Tidal Tuckahoe River Project:** This cooperative project with the Atlantic and Cape May County Health Departments monitored bacteria and used dye-testing to determine the reasons for high bacteria levels in the river.

Proposed Initiatives

Although nonpoint source pollution is a significant impediment to achieving desired water quality goals, very little monitoring has been performed. Upgraded monitoring is necessary to determine inputs and stream response so that distinctions between point and nonpoint source pollution effects can be determined. This information is crucial to evaluating nonpoint source pollution control programs and setting priorities for future nonpoint source control.

State and local governments have exercised relatively little authority to control nonpoint source pollution because of uncertainty about what controls to require and inadequate staff and funding resources for the job. The nonpoint source assessment report and management program prepared for EPA should assist the state and local governments in establishing priorities, developing guidelines, and allocating resources.

Federal assistance is necessary for some initiatives. For example, although New Jersey has initiated programs to control nonpoint source pollution within the state, EPA support is needed for interstate agreements, especially those concerning ocean pollution. EPA could also fund research projects of national significance, such as the behavior of hydrocarbons in ground water and nonpoint source toxic-

ity to various organisms. Finally, New Jersey believes that an interagency agreement between USDA and EPA to make commodity price support loans contingent upon the use of BMPs would provide incentives for farmers to follow state pollution guidelines.

Funding Summary

The New Jersey Department of Environmental Protection has \$867,000 available under section 205(j)(5). This money is being used to develop the state's nonpoint source management program and to further the Navesink Water Quality Improvement Project. Additional EPA funding is necessary to improve monitoring efforts so that sources of nonpoint source pollution can be identified and appropriate control measures and BMPs can be implemented and assessed.

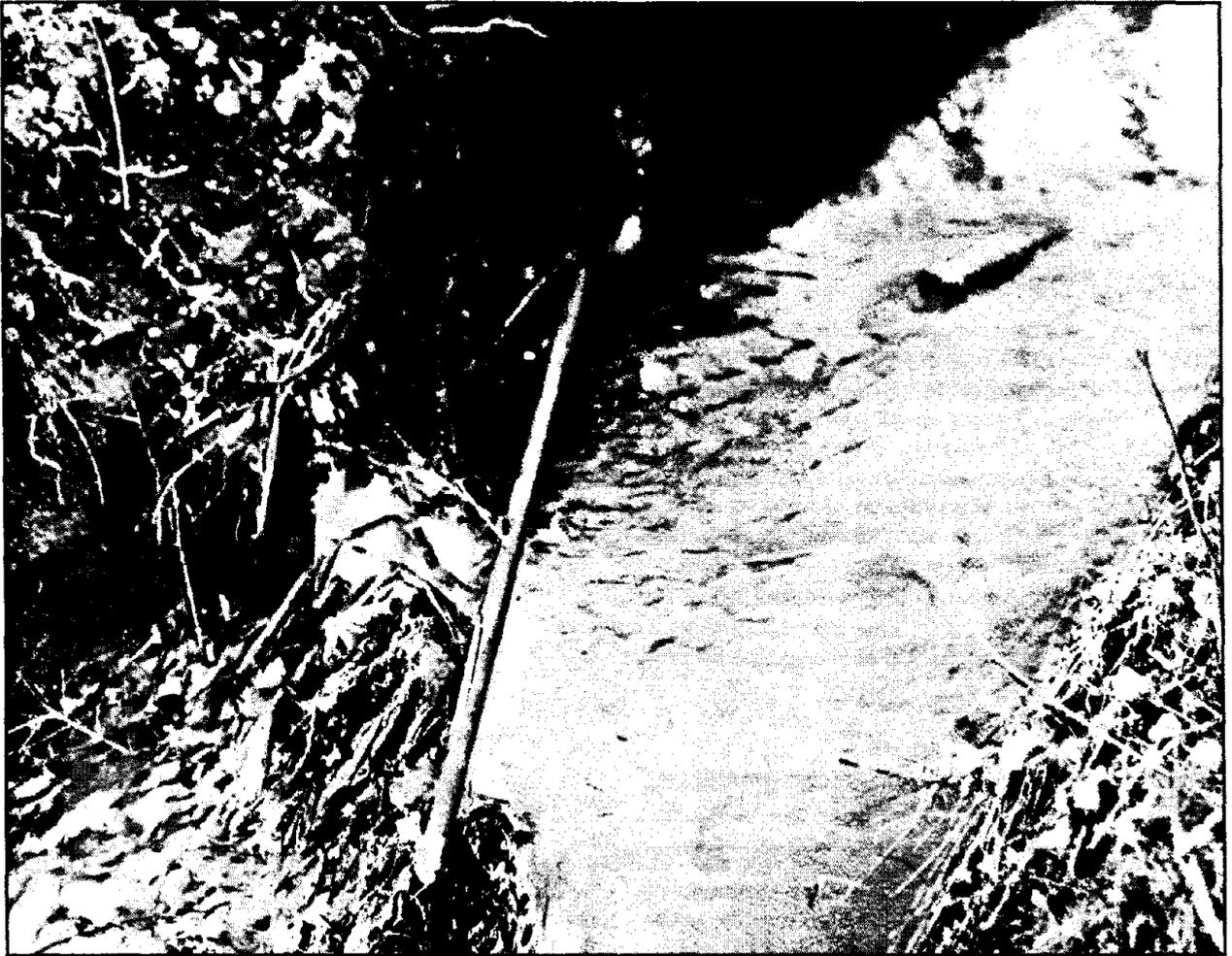
NEW YORK

New York has made a significant effort to address nonpoint source pollution and presently has over 50 ongoing state and local programs that either directly or indirectly control this environmental problem.

Statewide Activities

- **Improved Assessment:** A broader information-gathering program to obtain a more complete picture of nonpoint source pollution has been implemented with the participation of 57 soil and water conservation districts and the cooperation of the state Soil and Water Conservation Committee.
- **Public Education:** Nonpoint source pollution was the focus of the state's annual Water Week activities to inform the public. The program included school curriculum materials on nonpoint source pollution, a symposium, magazine and newspaper articles, and exhibits displayed in state offices. The New York State Water Resources Institute at Cornell University and the Cornell Cooperative Extension Service provided general educational materials, technical assistance, and research on nonpoint source pollutants.

During FY 1989, an impact study of pesticides on upstate ground water was completed, ground-



Eroding banks and human debris clutter this stream.

water educational materials were prepared and distributed, and nonpoint source management projects were undertaken in several counties.

- **Technical Assistance to Landowners:** During FY 1989, the New York Soil Conservation Service gave \$415,000 in technical assistance to landowners and land users in New York to help develop and implement conservation plans to reduce soil erosion and improve water quality. These activities included providing technical assistance to the New York State Department of Environmental Control to develop and implement the assessment report, the management program, and new state nonpoint source legislation.

Proposed Initiatives

- **Additional funding** is needed to guarantee that nonpoint source management programs will be fully implemented. It is especially im-

perative to secure funds for implementation of the new state nonpoint source pollution legislation.

- **Federal assistance** is also needed to develop a comprehensive education program on the hazards of nonpoint source water pollution with components appropriate to all age levels. Increased awareness is needed to assure the effectiveness of control programs.
- **Another area of needed federal action** involves regulation of the effects of interstate air emissions. Currently, atmospheric deposition is the largest category of nonpoint source pollution in New York state waterbodies. While New York has an enhanced control program for air emissions within the state, sources beyond New York's borders also adversely affect state waterbodies. Recent amendments to the Clean Air Act will help solve this problem.

- **Contaminated sediment** is another major category of nonpoint source pollution in New York state. Federal assistance is needed to define quality standards for sediments and to delineate acceptable disposal and/or destruction techniques.

Funding Summary

New York received approximately \$2,200,000 in 205(j)(5) funds in FY 1989. Of this amount, \$250,000 was allocated to the development of the state's section 319 assessment report and management program. The state has also expended \$1,250,000 to implement a nonpoint source control program to address the problem of bulk storage of petroleum products and other chemicals to protect ground-water resources.

A state revolving loan fund was authorized by the legislature in FY 1989. This may be used as a source of funding for nonpoint source pollution projects in the future.

PUERTO RICO

Nonpoint source pollution is caused by a number of factors in Puerto Rico. Major water quality problems resulting from agricultural runoff have dramatized the need for improved animal waste and cropland management systems. Sedimentation and uncontrolled erosion have been associated with construction and mining. Finally, high fecal coliform loadings and reduced dissolved oxygen levels in water have been caused by runoff from urban and rural communities.

Statewide Activities

Nonpoint source pollution programs in Puerto Rico in 1989 continued a management program begun in earlier years as a result of recommendations made in the 1979 report, *208 Islandwide Project: A Water Quality Management Plan for the Island of Puerto Rico*. Various demonstration/planning projects have been developed to address nonpoint source pollution problems. These projects have concentrated on two principal watersheds (Rio Grade de Loiza and Rio La Plata) and the north coast limestone area, the island's major aquifer zone. The major programs are:

- **Agricultural Runoff and Waste Control:** To deal with agricultural runoff, Puerto Rico's En-

vironmental Quality Board implemented an islandwide animal waste control program in the early 1980s. The program requires the utilization of conventional BMPs on poultry, hog, and dairy farms. In 1987, federal non-construction grant funds were used to strengthen the territorial effort by developing a watershed-specific BMP program for animal waste control.

- **Ground-water Quality Management and Protection Strategy:** The Ground-water Quality Management and Protection Strategy was begun in 1987 to protect ground-water resources from contamination. As one of the current initiatives in this program, the Environmental Quality Board is preparing a Wellhead Protection Program that will establish procedures to protect individual wells from surrounding sources of contamination.
- **Sediment and Erosion Control:** The Environmental Quality Board has administered an islandwide Sediment and Erosion Control Program since 1984 to control pollution problems such as sedimentation resulting from construction and mining.
- **Urban Runoff:** Urban runoff has not been extensively addressed in Puerto Rico because the environmental impact from the urban coastal centers such as San Juan, Ponce, Mayaguez, and Arecibo has been considered secondary to pollution from other sources. Environmental Quality Board efforts to control urban runoff have been concentrated in the San Juan metropolitan area, specifically in those areas affecting the beach front and the Martin Pena Channel.

Funding Summary

The Environmental Quality Board received approximately \$450,560 of 205(j)(5) funds from EPA. Of that amount, \$151,000 (FY 1987 funds) was used to develop the nonpoint source assessment report and management program. The remaining \$299,560 (FY 1988 funds) will be used to develop nonpoint source pollution control activities.

The Environmental Quality Board also received a \$95,946 EPA grant, matched with 30 percent non-federal monies, for Phase I of the Lake LaPlata Clean Lakes Project. In addition, \$375,000 was granted for Phase II of the project with the Environmental Quality Board providing a 50 percent match.

U.S. VIRGIN ISLANDS

The U.S. Virgin Islands has recently conducted a number of studies designed to assess impacts on water quality and develop nonpoint source pollution controls in the following areas:

- reducing sediment from construction sites; and
- reducing the effects of sediment on reef development.

These studies provided much data for the nonpoint source assessment report and management program.

Statewide Activities

Several current and projected initiatives are:

- **Nonpoint Source Pollution Assessments:** Further nonpoint source assessments will be conducted to update the list of waterbodies impacted by nonpoint source pollution and to revise the list of BMPs based on their effectiveness in controlling nonpoint source pollution.

- **Soil Conservation:** Through a Memorandum of Understanding with the U.S. Virgin Islands Soil Conservation District, SCS provides technical assistance to landowners and land users who are district cooperators. SCS has trained professional personnel in all areas of soil and water conservation and also developed the *Environmental Protection Handbook*, used for BMPs in earth movement activities.

- **Technical Assistance:** SCS, ASCS, and the Cooperative Extension Service are among the USDA agencies that are providing technical help to individuals, groups, and units of government involved in soil, water, plants, and related resources management.

Funding Summary

To date, no 205(j)(5) funds have been awarded to the U.S. Virgin Islands. However, extensive technical assistance has been provided by the regional office in the development of the nonpoint source assessment report.

REGION III

Region III approved all state assessments and fully or partially approved all management programs by January 1990. It determined that agriculture, silviculture, mining, and urban runoff are all major contributors to the Region's nonpoint source pollution problems.

The Region (Delaware, the District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia) has made a major commitment to reduce nutrients in the Chesapeake Bay watershed and directs a large proportion of its resources toward meeting that commitment.

Regional Highlight

A major source of nonpoint source pollution of ground and surface waters in Delaware is runoff from poultry operations. The Region has cooperated with Delaware to develop a "self-contained" system in which nutrients generated by the poultry industry are recycled.

Dead poultry is a major pollutant in Delaware, but the birds can be composted into an environmentally safe fertilizer. In addition, the industry generates approximately 300,000 tons of poultry manure with an estimated fertilizer value of \$10 million. The Region provided cost-sharing funds to help the state develop and implement a poultry waste resource management system. The funds were used to develop waste storage structures, waste treatment lagoons, dead bird disposal systems, and conservation tillage.

DELAWARE

Overview

Delaware made a commitment to control nonpoint sources before the passage of section 319. The state began nonpoint source control initiatives under section 208, the Delaware Conservation District programs, and the state Coastal Zone Management Program; now Delaware has a comprehensive nonpoint source management program built on both government and private activities. The Department of Natural Resources and Environmental Conserva-



● Regional Office

tion (DNREC) Division of Soil and Water Conservation and Delaware's Conservation Districts are the lead agencies for nonpoint source pollution control involving agriculture, woodlands, urban areas, and construction projects.

Statewide Activities

Delaware was the first state to have its management program and assessment report approved by EPA. It made significant progress in implementation during FY 1990.

- **Agriculture:** Animal wastes are a major source of nonpoint source pollution in Delaware. The state completed guidelines for land disposal in agricultural settings, educated more than 250 farmers on manure management, and provided financial assistance for manure testing and construction of animal waste storage structures. State and local agencies are cooperating on a demonstration project to compost dead chickens.



Delaware Gov. Castle (left) and Agriculture Secretary William B. Chandler, Jr. watch H. Edward Dutton, Jr. test the temperature on his chicken compost. Photo by Susan L. Gregg of News Journal.

- **Construction:** The state published an *Erosion and Sediment Control Handbook* to address construction activities. Highway personnel, engineers, contractors, and local officials will be trained on the design of erosion and sediment control plans.
- **Urban Runoff:** Delaware is working to establish state authority for storm water management. In addition, the state is developing a training program on BMPs for storm water management.

Watershed Activities

- **Nanticoke River:** This project involves a comprehensive poultry manure management program and includes evaluation as well as nonpoint source reduction activities. The project established research plots in which poultry manure was applied at varying rates. Soil and plant samples provided the means to evaluate nutrient uptake. The Sussex Conservation District contributed cost-sharing funds to construct two poultry manure storage structures. A preliminary biological sampling was conducted in the watershed in the spring of 1989. The state designated the site a demonstration project and included it in the statewide education and information activities.
- **Murderkill River Basin:** This project was designed to reduce nonpoint source pollution from erosion. Project sponsors and participants implemented BMPs for grassed waterways, cropland terraces, and impounded ponds. As a result of BMP implementation, the average annual soil loss was reduced by 490 tons.
The project includes an Integrated Pesticide Management Program, managed jointly with

the Cooperative Extension Service. In addition, the project includes an in-stream biological monitoring program. The state is preparing an education program for rural homeowners regarding the use of fertilizers, pesticides, and on-site wastewater systems; it will explain the necessary procedures for minimizing nonpoint source pollution. Efforts are being made to coordinate state nonpoint source pollution activities with the state Coastal Zone Management Program's Murderkill River corridor project.

DISTRICT OF COLUMBIA

Urban runoff is the primary source of nonpoint source pollution in the District of Columbia. All of the District's waters are affected by pollution from new construction, combined sewer overflows (CSOs), land disposal of wastes, and surface runoff. Control of nonpoint source pollution within the District has fallen into two categories:

- The promulgation of BMPs for new construction projects regulated by the Storm Water Management Program, and
- The CSO Abatement Program undertaken by the Department of Public Works.

In addition, a number of state and local control programs add to the District's nonpoint source control activities. Among them are the Chesapeake Bay Plan and the Anacostia River Restoration Strategy.

Districtwide Activities

- **Education:** The District maintains an ongoing effort to educate the public about its role in controlling nonpoint source pollution. For example, the District is preparing a storm water management brochure to educate citizens on BMPs. District staff are beginning to work with teachers to help them integrate environmental science into the curriculum and to assist in the development of outdoor classrooms.
- **Urban Runoff:** District regulations require developers to adopt BMPs to control storm water runoff from their projects and maintain nonpoint source pollution levels equivalent to or less than pre-development runoff levels. Developers must apply for permits, submit a storm water management plan, allow site inspections, and comply with erosion and sediment control regulations.

Erosion and sediment control regulations have been in place since 1977, and the District updates them as necessary to ensure compliance. Approximately 1,200 new projects for erosion control and 110 storm water plans were approved in FY 1989. Five waivers were granted to developers. It is anticipated that by the end of 1989, 200 BMPs for storm water management will be in use at new construction sites.

By January 1990, the District will have hired and trained new staff to implement and enforce nonpoint source controls. It had already hired staff for nonpoint source pollution monitoring and to monitor erosion control projects for the Storm Water Management Program. The District will continue to monitor nonpoint source pollution from various land use activities and anticipates that monitoring will be completed by the end of 1991. Once in place, storm water control BMPs will be monitored for efficiency in removing pollutants. Information from these monitoring efforts will be used to model pollutant loads.

The District will continue street sweeping, catch basin cleaning, and water quality inlet cleaning to reduce pollutants in surface runoff.

Watershed Activities

A number of rehabilitation projects are underway to reduce adverse effects of surface runoff on water quality. The Department of Public Works (DPW), Office of Planning, and the National Park Service are collaborating on a project to rehabilitate Kenilworth Marsh. The project involves modifying and improving degraded wetland along the Anacostia River, including creating a sedimentation forebay to protect the marsh against sediment loadings.

The DPW contracted with the University of Maryland's Born Point Lab to create tidal marshes in the District. Two sites were planted in May 1989 — one in Anacostia, where the plantings have successfully taken hold, and the other in Oxon Run, where the vegetation has not fared as well.

Evaluation of these new marshes will continue through 1990. The District expects to complete its assessment of the plants' heavy metal uptake by 1992.

The District has made some progress in meeting management program milestones. By end of 1989, the Metropolitan Washington Council of Governments will have performed a survey of retrofit sites and others for habitat improvement. By September 1989, the soil and water conservation district, the District's Soil Resources Branch, and USDA-SCS will have completed four streambank stabilization

projects. Three of these projects are along Watts Branch and already have been finished. By 1991, sub-watershed action plans for Watts Branch and Sickey Run will be completed.

During FY 1989 the District cleared and shaped a severely eroded hillside at the Phelps Center. It expects to finish the project by March 1992. By end of 1989, the District will specify an end-of-pipe BMP for the River Terrace area. Planning and design have been completed.

Water Quality Improvements

No significant improvements in water quality can be reported to date, in part because of heavy rains and high levels of sedimentation and other runoff in 1989.

Further Actions Needed

- **Water Quality Standards:** Updated water quality standards are needed for better nonpoint source control. The District's review of water quality standards was expected to be published in late 1989. Data for nonpoint source pollution load calculations will be collected in the storm water monitoring program in FY 1990; technical assistance is needed to determine nonpoint source pollution loads. In addition, more staff are needed to enforce storm water management and erosion control regulations.
- **Federal Consistency:** The District has had problems ensuring that federal agency actions are consistent with the District's nonpoint source pollution management program, largely because military bases occupy large plots of land along the District's waterfront. These bases occupy enough land to use nonpoint source controls, but none have been implemented. For example, Bolling Air Force Base removed much of its wooded buffer when it installed new storm drains that flow directly into the Potomac River. No storm water plan for the new drains was submitted to the District.

New federal buildings do not have to comply with District building regulations. Hence, there is no review process for compliance with storm water and erosion control regulations. Because 30 percent of the District is federally owned, federal compliance with these regulations is essential to reduce nonpoint source loads. The building code should be revised to include federal buildings.

Funding Summary

In FY 1988, the District spent \$23,197 of its 205(j)(5) grant on the purchase of equipment for nonpoint source pollution monitoring.

The District's Soil Resources Branch spent \$398,960 of its Chesapeake Bay Program Grant for the implementation and enforcement of the storm water management program.

MARYLAND

Maryland's nonpoint source program relies on a number of existing state programs that promote nonpoint source pollution control both directly and indirectly. However, the development of the section 319 assessment and management program has allowed the state to better coordinate these activities. State programs for agricultural pollution control, sediment control, urban storm water management, shellfish certification, abandoned surface mine reclamation, structural and nonstructural shore erosion control, and State Highway Administration pollution control all provide significant nonpoint source control benefits.

- **Chesapeake Bay Critical Area:** Maryland participates in the Chesapeake Bay Agreement and has adopted the Agreement's goal to reduce phosphorus and nitrogen loading to the Bay by 40 percent. In addition, a state commission oversees the locally implemented Chesapeake Bay Critical Area Program. The goals of this program are (1) to reduce nonpoint source pollutant loads entering the Bay, and (2) to preserve natural habitat near the Bay by establishing specific land use policies and development criteria. The program requires a minimum 1,000-foot-wide restricted area along the Bay shoreline and adjacent to all Maryland tributaries up to the head of the tide.

This program will have important nonpoint source control implications for the Bay and its major tributaries. It restricts the distribution and density of future development in much of this critical area and places new conditions on storm water management, farming, forestry, mining, and other activities in the Critical Area. By the end of 1988, all of the local governments had adopted Critical Area programs; the Critical Area Commission had approved 43 and 17 were awaiting approval.

Statewide Activities

- **Shore Erosion Prevention Program:** Maryland has two programs that provide financial and technical assistance to property owners and local governments for the development of measures (structural and nonstructural) to prevent shore erosion. In 1989, the state designed 19 structural projects and constructed 27. (The management program milestones called for the design and construction of 72 projects.) In addition, 160 technical assistance visits were made. The state awarded 34 grants to property owners for nonstructural control to cover 14,172 feet of shoreline. This far exceeded the management program goal of 15 grants. During this same period, 57 projects covering 32,195 feet of shoreline were completed.
- **Sediment and Erosion Control:** The state reviewed 660 state and federal projects for consistency with the state's erosion and sediment control program. It conducted 11,794 inspections, issued 367 violation notices, and provided technical assistance to 450 individuals. The State Highway Administration has also actively participated in the Sediment and Erosion Control Program and trained 60 inspectors in 1989.
- **Storm Water Management:** Maryland's storm water management law requires that a person submit a storm water management plan before beginning any land development. The agency provided technical assistance under this program and reviewed 670 plans. In addition, the state conducted research on the use of marshes for storm water management and monitored three infiltration BMPs for effectiveness in reducing nonpoint source pollution.
- **Agriculture:** Maryland's Agriculture Cost-share Program provides matching funds to initiate BMPs for managing soil loss, nutrient loads, or agricultural chemical loads and minimize the movement of these pollutants into state surface waters. In 1989, the state provided assistance on 726 projects. The Departments of Agriculture, Natural Resources, and the Environment have joint authority to promulgate regulations for the design, construction, operation, and maintenance of agricultural drainage projects to control nonpoint source pollution. Non-compliance with the regulations can result in administrative

orders, civil actions for damages, or injunctive relief. The state investigated 50 complaints in 1989.

PENNSYLVANIA

Statewide Activities

- **Manure Management Program:** This program addresses the proper handling and storage of the large quantity of animal wastes generated by Pennsylvania's agricultural operations. The program developed the *Manure Manual*, a series of publications providing technical guidance on accepted BMPs for manure handling and storage. The state has printed over 46,000 copies and made them available to farmers across the Commonwealth.

Pennsylvania conducted a trial program for inspecting farms in one south central region of the state in 1989, visiting 58 farms to determine whether their manure handling practices were in accord with the *Manure Manual*. Although the final report has not yet been prepared, the preliminary findings indicate few inconsistencies with the recommended practices. Moreover, Pennsylvania investigated over 100 complaints involving agricultural operations in 1989.
- **Integrated Pest Management (IPM):** The Pennsylvania Department of Agriculture began this program in 1989, initially focusing on education. The department prepared a slide show on IPM and distributed 20 copies to its regional offices and cooperating agencies for public viewing. The department is also developing an urban IPM exhibit.
- **Erosion and Sediment Control Program:** Under this program, state personnel reviewed more than 2,380 Erosion and Sediment Pollution Control Plans and conducted more than 1,300 site inspections (based on 66 percent of the county conservation districts reporting). The Department of Environmental Resources' (DER) Bureau of Soil and Water Conservation in FY 1989 handled 74 enforcement actions, which resulted in the collection of \$139,850 in civil penalties. The county conservation districts dealt with an additional 39 actions resulting in \$64,750 in civil penalties.



Runoff from this scene will carry sediment and nutrients to adjacent waters.

■ **Abandoned Coal Mines:** SCS assists landowners in reclaiming abandoned coal mines and land under the Rural Abandoned Mine Program (RAMP). The state has 240,000 acres of abandoned land once mined for coal, the greatest number of any state in the nation. Although RAMP has focused on eliminating health and safety hazards, RAMP projects (as of December 31, 1988) improved water quality in 97 miles of streams and 9,725 acres of lakes.

■ **Urban Runoff:** Pennsylvania's Storm Water Management Act addresses urban runoff by requiring counties to prepare watershed storm water management plans. Municipalities adopt and implement these plans through local ordinances. In FY 1989, the DER reviewed 15 watershed plans, three of which have been fully approved. The department anticipates reviewing 18 additional plans and approving six more in FY 1990. To date, 53 municipalities are authorized to enact or have enacted ordinances consistent with approved watershed plans. The department is projecting that 50 additional municipalities will enact ordinances in FY 1990.

Watershed Activities

■ **Chesapeake Bay:** Pennsylvania has participated in a number of activities to meet the Chesapeake Bay Agreement goal to reduce nutrients in runoff from Chesapeake Bay water-

sheds by 40 percent. The Pennsylvania Chesapeake Bay Program provided cost sharing to implement BMPs on farms through March 31, 1989. The total cost for implementing the BMPs exceeded \$6 million. The BMPs resulted in:

- reducing the annual nutrient load by more than 761,000 pounds of nitrogen and 609,000 pounds of phosphorus (as of March 31, 1989), and
- preventing more than 32,000 tons of sediment from entering Pennsylvania streams annually.

Five new Bureau of Soil and Water Conservation employees have been assigned to the Chesapeake Bay Program, including three nutrient management specialists, an engineer, and an enforcement specialist for the Erosion and Sediment Pollution Control Program. The following are highlights of the Chesapeake Bay Program educational activities:

- The Pennsylvania Office of the Chesapeake Bay Foundation produced a storm water management BMP manual for local officials and hired a full-time information specialist.
- The Bureau of Soil and Water Conservation's mobile nutrient laboratory publicized the importance of soil, water, and manure tests in the development of nutrient management

programs at 15 different agricultural events.

- The Chesapeake Bay Foundation Office developed technical guidance to help estimate nutrient loads from manure spread on fields that reach streams and ground water (for different times of the year and under various weather conditions). They also developed a guidance manual on animal and manure handling systems for individual farm operations.
- The Office distributed instructional materials to teachers throughout Pennsylvania that included information on the Chesapeake Bay Program and on a soils and land use curriculum.
- **Conestoga Headwaters:** The Conestoga Headwaters Project is part of the Rural Clean Water Program (RCWP). The project developed nutrient management plans that were implemented on 92 farms last year. Additional funds were provided for in-depth monitoring of the effectiveness of land use BMPs. The project effected a reduction of nitrogen use by 156,445 pounds and phosphorus use by 82,261 pounds on the 6,028 acres subject to management plans. That is equivalent to \$63,000 worth of chemical fertilizer.

The number of participating farms in the watershed has increased to 270, covering some 18,960 acres. This translates into a total annual savings of 542,125 pounds of nitrogen, 310,116 pounds of phosphate, and 260,369 pounds of potash. The equivalent fertilizer value of these savings is \$267,621 per year.
- **Lake Nockamixon:** Pennsylvania developed a four-year plan to reduce phosphorus, nitrogen, and suspended solids in Lake Nockamixon; the plan is now in its final year. The majority of the plan's BMPs are for manure management, soil testing for nutrients, and grass waterway diversions to prevent direct runoff to surface waters. High priority areas were targeted for conservation plan development and implementation, and 22 cooperators were identified. Six conservation plans have been completed and are being implemented. They have resulted in a soil savings of over 21,800 tons per year.
- **Red Clay Creek:** Red Clay Creek is a small watershed in eastern Pennsylvania that drains into Delaware. The watershed is con-

taminated by a variety of pollutants, including pesticides and other toxic substances from conventional agricultural operations and mushroom growing operations. U.S. EPA, Pennsylvania DER, and the Delaware Department of Natural Resources and Environmental Conservation developed a Toxic Substances Control Action Plan to address the problem, and Pennsylvania hired a Red Clay Creek Project Coordinator. The coordinator was instrumental in securing a grant from the EPA Delaware Estuary Program that will be used to develop and implement BMPs for the Red Clay Creek Basin over the next two years.

Water Quality Improvements

Although specific water quality improvements have not been reported, nonpoint source pollutant loadings have been reduced in a number of the watershed projects described.

Funding Summary

Pennsylvania received a 205(j)(5) grant for \$458,000 on June 22, 1988. The grant covered seven assessment and development tasks, as follows:

- \$93,000 for a Department of Environmental Resources assessment report and management program development and administration;
- \$140,500 for updating the state's nonpoint source assessment database;
- \$83,400 for a contract to revise the Penn State Runoff Model to include water quality parameters;
- \$45,000 for employing a coordinator to oversee nonpoint source assessment and implementation activities in the Red Clay Creek Watershed;
- \$83,400 for a statewide evaluation of agricultural nonpoint source pollution; and
- \$12,700 for updating the Ground-water System Inventory throughout the state.

The Commonwealth anticipates providing over a quarter of a million dollars to match implementation funds. Implementation activities include the construction of a wetland to demonstrate its effectiveness in treating acid mine drainage and implementation of BMPs to reduce nutrient, sediment, and toxic loads in two priority watersheds.

VIRGINIA

The Virginia Division of Soil and Water Conservation (DSWC) has responsibility for implementing a statewide nonpoint source pollution management program and for coordinating with other agencies and individuals. The State Water Control Board (SWCB) retains responsibility for establishing water quality standards for surface and ground water and for monitoring water quality. The DSWC works closely with the SWCB to ensure that nonpoint source control programs are consistent with the state's water quality standards.

Statewide Activities

A number of projects address commitments under the 1987 Chesapeake Bay agreement, including the goal to reduce nonpoint source loading to the bay by 40 percent by the year 2000.

- **Agriculture:** Virginia's nonpoint source pollution program made progress in 1989 addressing agricultural nonpoint source pollution, including:
 - Passing the 1989 Virginia Pesticide Control Act. The law seeks to improve pesticide management through education and stricter registration and licensing programs for those involved in pesticide labeling, sales, and application. The 1989 Act created the Virginia Pesticide Control Board and provided staff support within the Department of Agriculture and Consumer Services. Regulations are currently being promulgated to implement provisions of the act.
 - Providing (through DSWC) almost \$2 million in cost-sharing funds to implement agricultural BMPs in the Chesapeake Bay basin and in other state watersheds. In addition to the state cost-share program, the division initiated a Nutrient Management Program in 1989. The program is implemented by 11 nutrient managers located in regional (field) offices. Following personnel training and program development, 124 nutrient management plans were developed in 1989 for over 36,000 acres. The nonpoint source pollution management program also established a number of on-farm projects to demonstrate optimum nutrient management. Technical assistance and nutrient management training were also provided through the program.
- **Forestry:** State activities to address nonpoint source runoff from forestry activities included:
 - Developing a reporting system linking BMP installation to measures of BMP effectiveness. The information will be combined with a computer model to provide more accurate estimates of forestry nonpoint source pollution trends.
 - Producing and distributing an updated *Forestry BMP Handbook*.
 - Creating a procedure to register citizen complaints regarding Department of Forestry activities. Citizen complaints are registered and investigated on-site by the Department of Forestry within 24 hours of the complaint. Recommendations for correcting the problem are given to the landowner, logger, timber buyer, or other party responsible for the problem. Follow-up inspections are made and the complainant is notified of remedial actions. Twenty-five complaints were registered and investigated during 1989.
 - Monitoring the effectiveness of forestry BMPs in both the Jefferson and George Washington National Forests.
 - Inspecting 1,049 tracts of land from January to July 1989 to evaluate compliance with forestry BMPs. Inspection results suggest that over 75 percent of the forest tracts inspected were in compliance with BMPs.

However, the inspection also indicated that, in the remaining tracts, BMP devices were improperly located, installed, or maintained. To encourage compliance with forestry BMPs, the party responsible for the tract was notified of remedial measures necessary to bring the tract into compliance.

The Department of Forestry cautioned that this information is not indicative of the effectiveness of BMPs in reducing nonpoint source pollution. The department acknowledges that inspection data represent the subjective judgment of the inspecting forester and do not involve monitoring or direct evaluation of water quality relative to the logged area and installed BMPs. Quantitative monitoring, water quality analysis, and subsequent modeling research will begin in 1990 to better evaluate the effectiveness of BMP implementation.

■ **Urban and Construction Runoff:** In 1989, state activities addressing these sources included:

- Revising the *Virginia Erosion and Sediment Control Handbook* and the *Urban BMP Handbook*. These documents will be combined in a single *Urban Conservation Handbook* scheduled for completion in 1990.
- Providing technical assistance through DSWC presentation of Erosion and Sediment Control seminars. Four storm water management seminars are planned for FY 1990.
- Preparing and presenting "problem solving workshops" for the Virginia Department of Transportation inspectors and contractors. VDOT also conducted two erosion control programs for 204 new inspectors.
- The state passed a comprehensive storm water management law in 1989. Regulations are being developed. The Storm Water Management Act separates storm water management from the existing Erosion and Sediment Control Regulations. The act authorizes localities to develop and implement a storm water management program that can require:
 - separate storm water management plans for new development,
 - water quality monitoring,
 - regional storm water planning,
 - integration with existing, related programs (flood control, erosion and sediment control, etc.),
 - minimum design criteria, and
 - maintenance of storm water management facilities.

In addition, any state funded project must meet state storm water management requirements.

- DSWC hired 11 new field personnel and two trainers to implement the state Erosion and Sediment Control Law. Six new employees will be hired in FY 1990 to assist in the storm water management program.
- The DSWC reviewed 49 projects for controlling runoff and determined that 70 percent

demonstrated effective mitigation of soil loss and compliance with the Erosion and Sediment Control Law.

- The Council on the Environment provided funds to three local agencies to develop model urban nonpoint source management programs, including programs for storm water management, urban nonpoint source management, and placement of water quality protection demonstration projects.

Water Quality Improvements

To meet the Chesapeake Bay Agreement goal of reducing total nonpoint source loadings by 40 percent, Virginia is placing a new emphasis on nonpoint source loads from non-agricultural sources such as urban runoff, silviculture, and atmospheric deposits. The state has already reduced nitrogen and phosphorus levels from all sources by 5.5 percent and 5.4 percent, respectively.

WEST VIRGINIA

The West Virginia Department of Natural Resources (DNR) and the West Virginia Soil Conservation Committee signed an updated memorandum of understanding to strengthen the relationship between these two agencies. The West Virginia Soil Conservation Committee is the lead agency for implementing the agriculture and construction portions of the state nonpoint source management program.

Statewide Activities

- **Construction:** West Virginia developed a demonstration site on the grounds of the Cedar Lakes Environmental Training Center near Ripley, for construction BMPs and erosion control. The project is a joint effort between industry, labor, and government.

The West Virginia Department of Highways (DOH), the lead agency for the highway construction portion of the construction management program, developed a generic sediment control plan for small bridge replacement projects. In addition, the DOH is updating its maintenance manual and developing an environmental education program for DOH personnel to reflect current technology for nonpoint

source management. DOH will offer the education program on a trial basis in one DOH district and, if successful, expand it to include the entire state.

The state is working with the New River Parkway Authority to develop land use regulations and ensure that the authority's highway development activities are in compliance with nonpoint source construction management programs.

- **Silviculture:** The state launched a new silvicultural education program to educate forest landowners on the use of forestry BMPs. The program discusses why BMPs are needed, how they benefit the landowner, and how to ensure that they are used in logging operations on privately owned land. The state developed, or specifically revised, a variety of educational materials for use with this program.

Watershed Activities

The U.S. Geological Survey, the Soil Conservation Service, and the West Virginia DNR conducted a cooperative study to determine the effects of sediment

control measures on soil erosion and sediment transport in areas of intensive oil and gas development in Ritchie County.

USGS and the West Virginia DNR completed a cooperative study to determine the origin and magnitude of suspended sediments in the Elk River basin. Both reports are expected to be approved and published in the near future.

The state also provided technical assistance to the acid mine drainage water quality improvement project for Big Sandy Creek in Preston County. The state prepared a preliminary feasibility report for the Webster Gob project site incorporating the abatement techniques suggested in the nonpoint source mining management program. To neutralize the acid mine drainage from the area, water discharged from three deep mine portals flows into an alkaline leach bed before leaving the project site. Monitoring shows a great improvement in the discharge leaving the alkaline leach bed, with the pH level changing from 3.2 to 7.2. The DNR also reviewed 32 environmental assessments for abandoned mine land projects as part of NEPA (National Environmental Protection Act) requirements. Problems were identified and resolved in 10 of the projects.

REGION IV

All Region IV states (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee) have submitted final nonpoint source assessment reports and management programs.

Program development and implementation are proceeding, with improved communication evident among multi-level public agencies, landowners, and industry. So is the strong public support for early demonstration projects. It is apparent that with the encouragement of EPA and state leadership, the southeastern United States can address its nonpoint source problems, and produce substantial environmental improvements.

Region IV's nonpoint source pollution is attributable primarily to agriculture. Because of the extensive dairy, chicken, and hog production in this Region, animal waste poses a significant management problem; it is believed to be a principal source of fecal coliform and nutrient contamination of the Region's waters. Urban runoff, construction, mining, and silviculture operations also contribute to nonpoint source pollution.

During FY 1989, the Region IV Steering Committee approved and adopted

- The long-range plan of the Land and Water 201 Program, which identifies the Region's resource management needs and numerical goals to be accomplished by the year 2000, and
- An implementation strategy for the participating agencies in cooperation with private land users and the public.

Region IV also has established an Agricultural Policy Committee composed of regional staff from the following areas: nonpoint source, pesticides, ground water, wetlands/estuarine, nonpoint source, and other programs that overlap in the rural environment. The committee hosted the first USDA-EPA forum on rural environmental issues and has initiated an ambitious agenda for future actions aimed at increasing communication and responsiveness within the Region on agricultural/rural environmental matters.

A number of multi-level, multi-agency, and landowner demonstration projects are underway, most initiated by EPA or SCS. Among the most notable are:



● Regional Office

- **Mississippi Delta erosion prevention project**, sponsored by EPA through an interagency agreement with SCS.
- **Sand Mountain-Lake Guntersville project**, which deals with poultry wastes and septic problems associated with a high density rural population, sponsored by the Land and Water 201 agencies.
- **Georgia dairy waste management project**, sponsored by both EPA and SCS, and involving federal, state and local agencies.

Regional Highlight

Compounding the Region's nonpoint source problems are unique geological formations such as karst (sinkhole) topography. In extensive areas of Kentucky, Tennessee, Florida, and parts of Georgia, ground water is particularly vulnerable to pesticide, fertilizer and manure runoff from fields, and discharges from failing animal waste lagoons and septic tanks. These waters are directly exposed to high concentrations of nitrates, sediment, bacteria, and

pesticides. Conventional monitoring, waste treatment, cropland BMPs, and other water protection strategies often are not effective.

To address issues peculiar to karst topography, EPA is working with county conservation districts, the Commonwealth of Kentucky, the National Park Service, the Tennessee Valley Authority, and the U.S. Department of Agriculture in a demonstration project in the karst area surrounding Mammoth Cave, Kentucky. Sinkholes and intense cropland and animal/dairy production characterize this five-county area, which relies on ground water for 75 percent of its drinking water supply. The project will include monitoring the effects of land use on underground streams, developing land treatments to reduce the flow of ground-water pollutants, improving animal waste facilities, and providing better educational programs and information management systems.

ALABAMA

Nonpoint source control activities in Alabama include the application of BMPs to control sediment and properly manage animal waste and the education of users on the proper use and application of agricultural chemicals. Most of these activities occur under existing programs.

Statewide Activities

- **Resource Extraction:** Nonpoint source pollution resulting from resource extraction is controlled through existing programs such as permitting, inspection, enforcement, and reclamation. These programs are designed to reduce the effects on waterbodies of sediments, acidity/alkalinity, and metals generated by mining.

Eighteen reclamation projects were completed in FY 1989 under the Abandoned Mine Land Reclamation Program managed by the State Department of Industrial Relations. Efforts to control nonpoint source impacts from coalbed methane exploration and recovery dramatically increased in FY 1989. Activities included not only inspection and enforcement but also increased educational efforts.

- **Silviculture:** Implementation activities also are targeted at silviculture, with special emphases on inspection, enforcement, and education on BMPs. Evaluation and revision of

silvicultural BMPs began in 1989 with guidance documents available in mid-FY 1990.

- **Urban Runoff and Construction:** Activities targeting these types of nonpoint sources have been limited to inspection and enforcement and the adoption of construction and land development ordinances by a few municipalities. Recent increases in the number of complaints about construction site runoff have prompted more state inspection and enforcement. The State Department of Environmental Management will encourage the adoption and enforcement of erosion control ordinances by more municipalities.

Watershed Activities

As with statewide activities, specific watershed efforts have been somewhat limited to those undertaken by existing programs. Watershed projects currently underway in Alabama are Sand Mountain-Lake Guntersville, Bear Creek, Blue Creek, Big Prairie Creek, Upper Black Warrior Water Quality Project, Chewacla Creek, Flat Creek, Herrin Creek, and Blue Springs Creek.

TVA's Bear Creek watershed project involves designing and funding BMPs to control animal wastes in the watershed. Voluntary participation by landowners in the watershed has been high and a number of animal waste management systems were installed under the cost-sharing program in 1989. TVA and SCS also initiated a farmer-related education program in the watershed to ensure that installed BMPs were properly operated and maintained. Water quality monitoring by TVA indicates a significant reduction in bacterial contamination since the project began. Because of the improvement in water quality, the agencies involved re-opened the floatway for recreational use in 1990. TVA will continue to monitor water quality to determine the effectiveness of the BMPs.

Further Actions

Because Alabama's management program was approved only recently, progress in meeting nonpoint source control goals has been limited. However, efforts are underway to evaluate agricultural, resource extraction, and silvicultural BMPs and to implement revised BMPs to protect surface and ground water. Progress has also been made in assessing agricultural pesticides in ground water. Increased inspection and enforcement are resulting in greater utilization of BMPs by the coalbed methane industry.



The Bear Creek floatery during low water. Photo by Dick Green, Tennessee Valley Authority.

In many cases, improvements in water quality have yet to be realized or documented. However, reductions in bacterial loadings in the Bear Creek watershed suggest that efforts to control nonpoint source pollutants may be improving water quality.

In past years, most water quality data were generated in response to point source programs and thus do not reflect nonpoint source impairments. As part of its nonpoint source program, Alabama has begun to develop a nonpoint source database to track improvements in water quality.

Future programs to control nonpoint source pollution should include education as a primary component. Public awareness is necessary to change behavior patterns and actions that contribute to the nonpoint source pollution problem.

Funding Summary

Grants for nonpoint source program development and implementation for FY 1989 consisted of 205(j)(5) funds (\$104,821), a carryover of unused FY 1988 federal funds (\$150,000), and state funds (\$125,650).

FLORIDA

Florida's nonpoint source implementation activities include enforcement of regulations that require BMPs for erosion and sediment control during and after construction; enforcement of wetland protection regulations; public education programs; monitoring; BMP evaluation; and providing technical assistance.

Statewide Activities

- **SWIM:** The state's growth management program and the Surface Water Improvement and Management (SWIM) program have greatly expanded awareness of nonpoint source water quality problems and the implementation of watershed management strategies. SWIM plans have been approved for the priority waterbodies listed in the Florida assessment: Apalachicola River, Apalachicola Bay, Lake Jackson, Deerpoint Lake, Pensacola Bay, Upper and Lower Suwannee River, Santa Fe River, Steinhatchee River, Alligator Lake, Falling Creek, Tampa Bay, Rainbow River, Banana Lake, Crystal River/Kings River Lagoon, Lake

Apopka, Upper Oklawaha River, Lake Okeechobee/ Kissimmee River, and Biscayne Bay.

- **Urban Runoff:** Florida has undertaken several initiatives to address storm water runoff. The state worked with EPA to refine the draft NPDES storm water regulation published in December 1988. In addition, comprehensive storm water management legislation developed by the state government passed the 1989 Florida Legislature. The legislation integrates the storm water regulatory program, the SWIM program, and the growth management program into a comprehensive watershed approach to reducing storm water pollution loadings.

To assist with implementation of the legislation, the state government has provided technical assistance to water management districts, local governments, and the private sector. In addition, the department continues to conduct research on the efficiency of various storm water BMPs.

The state also has helped local governments revise their land development codes to include ordinances that will further reduce nonpoint source pollution. The state also has recommended that local governments establish storm water utilities to provide a dedicated source of revenues for the development and implementation of storm water master plans.

The state began public education efforts in the late 1970s and has continued these efforts throughout the 1980s. The most recent example of public education is the distribution of nearly 1,200 copies of the *Florida Development Manual: A Guide to Sound Land and Water Management* to local governments, state agencies, consulting engineers, planners, and citizens.

The state is having problems getting the Federal Highway Administration to recognize the water quality degradation associated with storm water runoff from highways. Although the agency provides funding for implementing BMPs to control erosion and sedimentation during highway construction, it does not provide funds for storm water treatment BMPs required by state regulations and the state nonpoint source management program.

Funding Summary

The state used FY 1987 205(j)(5) (at 100 percent federal funding) to conduct the statewide nonpoint source assessment and to prepare the management program.

KENTUCKY

Statewide Activities

Kentucky conservation districts are the local implementing agencies for nonpoint source construction and agriculture programs. Nonpoint source program staff assisted several conservation districts in preparing proposals for the Agricultural Stabilization and Conservation Service's (ASCS) water quality special projects, helped three conservation districts formulate the water quality components of their long-range plans, and provided an exhibit and educational materials at the Kentucky Association of Conservation Districts' annual convention.

The staff also began to expand the Division of Water's Water Watch program to address the educational, assessment, and monitoring objectives of the nonpoint source management programs. The Water Watch coordinator is training adopt-a-lake (or stream) groups in developing an awareness of land-disturbing activities in their watershed.

Disseminating nonpoint source information is a major focus of the program. Kentucky has developed a library of nonpoint source materials by cataloging all documents on a computer. The University of Kentucky Cooperative Extension Service is evaluating and updating existing educational materials related to the control of agricultural nonpoint source pollution. The Kentucky Division of Conservation will be working to update existing brochures, slide shows, and BMP manuals for agriculture and construction.

The Extension Service has conducted the first phase of a water quality training program for county extension specialists. The second phase of training now underway emphasizes reducing water pollution arising from agricultural activities.

Nonpoint source staff will continue to assist conservation districts in water quality educational activities as needed and to work with the Water Watch coordinator to enhance nonpoint source educational, assessment, and monitoring activities.

Watershed Activities

Two nonpoint source on-site planning field teams are responsible for implementing watershed monitoring activities. Each team consists of a Division of Water field team leader with an aquatic ecology background and a Division of Conservation team member with an agronomy/agriculture background.

- **Upper Green River Watershed:** The Concerned Citizens of Upper Green River for Bet-

ter Water Quality have raised public consciousness about water quality issues in their watershed. In association with the Soil Conservation Service, this group applied for and received a federal grant from ASCS for implementing agricultural best management practices at a 75/25 cost share. The nonpoint source teams have conducted county-level field reconnaissance with each SCS district conservationist to identify possible BMP installation sites and water quality sampling stations and verify and update land use/land cover data. These land use/cover/treatment data included (but were not limited to) geology, pesticide usage, number of failing septic systems, and number of dairies and animal waste facilities in the watershed. A study plan has been developed that proposes pre- and post-BMP monitoring using a paired watershed approach to document the long-term effects of agricultural BMPs (especially nutrient management BMPs) on water quality. One set of pre-BMP low/normal flow condition water samples has been collected for each station. Biological data (fish, macroinvertebrates, and algae) also will be collected at each station to supplement water chemistry data.

Further actions needed in this watershed include (1) implementation of physicochemical and biological pre-BMP data collection, and (2) evaluation and reporting of pre-BMP data results.

- **Mammoth Cave/Karst Area Water Quality Project:** The Division of Water worked with EPA, the Division of Conservation, the SCS area conservationists in Bowling Green, and the Barren County Conservation District to initiate a long-range water quality project to protect the cave system in Mammoth Cave National Park from agricultural and other sources of nonpoint source pollution. The cave system, the largest in the world, is threatened by both point and nonpoint source problems that threaten to close the caves to the public, jeopardizing an outstanding natural resource and a \$40 million a year tourist industry.

The project was launched at a meeting of agencies and universities in September 1989. Subsequent to the meeting, a locally sponsored Project Oversight Committee was formed, which in turn established a Technical Advisory Committee that has selected a target ground-water drainage basin for monitoring and BMP implementation. Activities planned to further develop the project include:

- hiring a project coordinator,

- establishing a water quality monitoring network,
- establishing two demonstration farms,
- targeting funds from a \$400,000 USDA Agricultural Conservation Practices grant to install agricultural BMPs, and
- Planning and conducting educational activities in the ground-water basins draining into the cave system.

The Division of Water, which is represented on the Technical Advisory Committee, will assist with planning and monitoring and will administer the section 319 funds provided for various phases for the project.

- **Salt River/Taylorville Reservoir Watershed:** This project is designed to determine the legitimate stream uses of the Salt River system from the Taylorville Reservoir Dam upstream. The basin is being adversely affected by excessive nutrient and sediment loading from a wide variety of activities. State nonpoint source on-site planning teams compiled land use information and other data for the project.

Further actions needed in this watershed include:

- approving a final study plan,
- implementing the nonpoint source assessment study, and
- evaluating and reporting study results.

Progress in Meeting Management Program Milestones

The actual collection, assessment, evaluation, and interpretation of both water quality and land-based data are the responsibility of the nonpoint source on-site planning field teams. Physical characteristics of the aquatic environment, water chemistry, aquatic biological community structure, and land use/treatment activities are different aspects of the waterbody's ecosystem that may be monitored. A multi-faceted monitoring approach is necessary because of

- the mobility of nonpoint source pollutants,
- the varying degrees of pollutant toxicity,
- the close interrelationship of land-based activities and nonpoint source pollution, and
- the spatial and temporal variabilities that exist in natural, dynamic ecosystems.

Standard operating procedures specific for nonpoint source pollution monitoring activities are being developed for quality assurance and quality control. Nonpoint source standard operating procedures will provide instruction, guidance, and standardization for study plan development, station location selection, water quality monitoring, land use/treatment monitoring, and weather monitoring.

MISSISSIPPI

Statewide Activities

Mississippi's Bureau of Pollution Control (BPC) is drafting a statewide Erosion and Sediment Control Law. The law should provide a useful tool to reduce nonpoint source impacts from construction activities. A draft is expected to be completed in early FY 1990.

The Mississippi Forestry Commission recently published a manual detailing silvicultural BMP guidelines for maintaining and improving water quality. The commission met with the Mississippi Forestry Association and Mississippi Cooperative Extension Service to plan a statewide training program for loggers, foresters, and landowners on using BMPs to control silvicultural nonpoint source pollution.

State and federal agencies, together with numerous public and private organizations, are developing a program to collect and dispose of pesticide containers. A volunteer pilot program in Washington County already is underway; if successful, similar projects will be initiated elsewhere in the state.

Watershed Activities

- **Yazoo Basin** is the site of a U.S. Army Corps of Engineers/SCS erosion control demonstration project that will include comprehensive monitoring and evaluation during and after project implementation. The purpose of the project is to reduce flooding, erosion, and sedimentation and to increase public awareness of nonpoint source pollution.
- **Tangipahoa River**, a watershed targeted for nonpoint source control by both Louisiana and Mississippi, is the subject of a cooperative river basin study in which BPC is developing and implementing a comprehensive water quality monitoring plan. The plan is intended to assess water quality impacts attributable to fecal coliform bacteria from both nonpoint and point sources in the watershed and to obtain

baseline water quality information needed to establish a database for future resource management.

- **The state has received Clean Lakes Program grants** to conduct Phase I studies for three lakes: Wolf Lake, Moon Lake, and Lake Washington. These studies are intended to identify ways to improve water quality and restore beneficial uses. The projects began in May 1989 and are scheduled to be completed by November 1990.

NORTH CAROLINA

Statewide Activities

North Carolina made significant progress in its nonpoint source program by passing legislation in a number of areas, including:

- Mandating nonpoint source pollution control for surface water supplies. For the first time, upstream municipalities will be required to implement nonpoint source controls to protect downstream water supplies.
- Requiring undisturbed buffer zones adjacent to trout streams.
- Limiting the exemption in the sedimentation control law to only those forestry activities where best management practices are used.
- Increasing cost-share funds to implement BMPs through the state's Agriculture Cost Share Program. The program was also expanded statewide. In addition, BMPs for trout farms in western North Carolina are now included on the list of approved BMPs and as such are eligible for cost-sharing.
- Establishing a goal to recycle 25 percent of the total solid waste stream in the state by 1993. This should reduce the state's need for new land disposal sites. Thirteen positions have been appropriated to provide guidelines and direction for local government planning on solid waste issues including impacts to water quality. A revolving fund was established for loans to construct lined landfills and to begin recycling projects.
- Requiring the phase-in of a statewide plan for storm water rules and programs.



The slogan of North Carolina's conservation districts, this message was planted in ryegrass in a coastal bermuda field by Albert Troutman, Jr., then chairman of the North Carolina Soil and Water Commission. When frost turned the bermuda brown, the large green (2 feet high) letters spelled out the message to airplane passengers until late May. Photo by Jim Page, North Carolina Department of Natural Resources and Community Development.

The state also adopted rules to provide nonpoint source pollution protection of the state's highest quality streams. Certain waters with quality higher than the standards are now afforded more protection from nonpoint source pollution by subjecting them to a new surface water classification scheme that has more stringent requirements.

The state continued to classify qualified waterbodies as Outstanding Resource Waters. An Outstanding Resource Waters designation requires special management strategies to maintain and protect the outstanding values of these waters from point and nonpoint source pollution. There are currently 198,000 acres and 871 miles of surface waters that have been classified as Outstanding Resource Waters.

The State Environmental Management Commission adopted revised water quality standards applicable to North Carolina surface waters and ground water. Several of the revised standards have implications for nonpoint source pollution control. For example, the turbidity standard for all fresh surface water now specifies that to comply with the standard, approved BMPs must be used during land management activities. Violators of the turbidity standard are subject to civil and criminal penalties.

The fecal coliform standard was also strengthened to protect swimming uses in all state waters. The number of ground-water standards for pesticides and other chemicals also increased significantly.

There were major expansions in the state's nonpoint source-related ground-water and wetlands protection programs. The General Assembly voted to fund an interagency study on the effects of pesticides on ground-water quality, to create an Underground Storage Tank Clean-up Fund, and to form a Legislative Study Commission on wetland protection.

Targeted watershed efforts during FY 1989 included the completion of the Lockwoods Folly River Water Quality Evaluation Report, which will eventually lead to a nonpoint source management plan for the watershed. In addition, the state designated the Tar-Pamlico River as a Nutrient Sensitive Water, thus requiring a nutrient management strategy for point and nonpoint source pollution.

Other nonpoint source-related achievements during FY 1989 include amending regulations for sewage treatment and disposal systems, researching the benefits of agricultural BMPs, and conducting educational programs.

SOUTH CAROLINA

Statewide Activities

South Carolina is implementing nonpoint source pollution controls through voluntary BMPs (particularly for agriculture and forestry) by using demonstrations, seminars, technology transfer, and financial and technical assistance. In addition, the state is enforcing regulations and mandatory BMPs where applicable.

Under current law, BMPs must be implemented for land disposal, mining, hydrologic/wetlands modification, construction, and urban storm water activities in certain counties, silvicultural activities on federal and state lands, and some activities related to the disposal of agricultural waste.

During FY 1989, South Carolina's Department of Health and Environmental Control (DHEC) issued 133 permits for the construction of agricultural waste management systems (generally animal waste management systems) and 272 certifications for Army Corps of Engineers permits under section 401 of the Clean Water Act. South Carolina's Land Resources Conservation Commission issued 55 mining operating permits that require BMPs to control erosion and runoff.

The DHEC helped establish joint ventures designed to gather and evaluate data about waterbodies impaired by nonpoint source pollution. These ventures included contracts with the U.S. Geological Survey to gather storm water data on the Ashley River and with the South Carolina Land Resources Conservation Commission (LRCC) to acquire new statewide aerial photography.

Several state agencies also are evaluating whether new laws or regulations should be considered for nonpoint source categories. The South Carolina LRCC submitted proposed legislation to the General Assembly that would require a storm water management and sediment control program meeting state criteria.

The LRCC established a program to inspect highway construction projects and review erosion, sediment, and storm water standards and specifications of the South Carolina Department of Highways and Public Transportation, recommending revisions where necessary through the federal consistency provisions of section 319.

The South Carolina Forestry Commission produced two slide-tape programs: one on BMPs for general audiences and the other outlining BMPs for wetland road construction and timber harvesting. The agency also has publicized and encouraged the use of forestry BMPs by distributing approximately

7,500 copies of the book, *Voluntary Forest Practice Guidelines*, and 6,500 copies of the book, *Best Management Practices for South Carolina's Wetlands*.

The South Carolina Coastal Council, a nonpoint source coordinating agency, has begun to develop storm water control programs for beachfront communities. Goals for the programs include maintaining or reducing the number of ocean storm water outfalls and using BMPs to pretreat storm water discharges. South Carolina will evaluate BMPs and develop new ones as it begins to implement its statewide nonpoint source program.

The State Land Resources Conservation Commission is helping to develop two experimental BMPs for agriculture: furrow diking and interseeding. The commission also is examining whether storm water utilities can control urban storm water throughout an entire watershed. In addition, the state will be developing new education, demonstration, and financial assistance programs for each nonpoint source category.

Watershed Activities

The State Nonpoint Source Task Force targeted 26 watersheds for implementation of nonpoint source management actions and will add more watersheds after evaluating the areas that show evidence of being affected by nonpoint source pollution.

The state has designated the following waterbodies as watershed projects: Murrells Inlet, Kinley Creek, Long Cane Creek, and Lake Marion. Lake Bowen and Camping Creek are being considered by SCS for funding under a new water quality program.

TENNESSEE

Tennessee's nonpoint source program staff has begun activities to increase public awareness on nonpoint source pollution. A nonpoint source slideshow along with other handouts and fact sheets have been effective tools to increase public awareness.

Watershed Activities

In April 1989, the state nonpoint source management advisory group developed a list of watersheds to be targeted for nonpoint source controls. The state will focus its resources on the five watersheds on this list as section 319 funds become available.

Projects in specific watersheds include the following:



These crops are planted improperly, right up to the eroding coastal shoreline.

- **Mobley Spring:** This project is designed to determine how storm water runoff affects local ground-water quality.
- **Reelfoot Lake:** A two-year study of streamflow and water quality will be undertaken in the three tributaries that surround this lake. The study is expected to show that the tributaries contain considerable amounts of suspended sediment, along with residues of fertilizers and pesticides, because of the high level of agricultural activity in the area surrounding the lake.
- **Oostanaula Creek:** A two-year project will be conducted by ASCS and SCS to install animal waste management systems. Pre- and post-BMP monitoring activities are being coordinated to demonstrate water quality improvements resulting from BMP implementation. Aerial photography and interpretation of land use and nonpoint source pollution have been completed by TVA for the watershed. A similar aerial inventory is being conducted by TVA in the Nolichucky River watershed.
- **Abandoned Mine Projects:** Tennessee has a number of abandoned mine reclamation projects underway. Each of the projects has significant nonpoint source pollution problems. The Meadow Creek Project and the Dean Project involve the sealing of portals, the demolition of structures, and the hauling of refuse to a fill area for revegetation. The Bear Creek watershed, a larger watershed, will be the site of a five-year BMP implementation project.
 Tennessee is working to enforce required permit and contract conditions concerning nonpoint source pollution control. The State Division of Water Pollution Control issued 188 aquatic resource alteration permits in FY 1989; 44 percent of all permits involving wetlands destruction of one acre or more were denied while the remaining 56 percent required some form of mitigation.
 During FY 1989, the division issued 145 section 401 certifications and approximately 150 gravel dredging permits. The state has been relatively successful in enforcing required permit and contract conditions concerning nonpoint source pollution.

Funding Summary

Approximately \$150,000 annually of 205(j)(5) funds have been used for contracting \$600,000 per year for nonpoint source program activities from October 1987 through June 1991. A total of \$555,000 USGS federal matching funds have also been dedicated. Total nonpoint source program development funds including non-205(j)(5) funds for FY 1988-91 equal \$1.6 million.

REGION V

To ensure approval of high quality nonpoint source assessments and management programs, Region V established a comprehensive review process. The following Region V offices and the Great Lakes National Program Office reviewed each state's (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin) submittal for compliance with section 319 requirements, integration with ongoing EPA programs and initiatives, and achievement of environmental results:

- Water Division (Office of Ground-water, Planning and Standards Section, Office of Wetlands, Permits, and Watershed Management Team), and the
- Environmental Science Division (Monitoring, Pesticides).

The Regional Watershed Management Team continued to provide technical support to the Regional Ground-water and Pesticide Programs. The team concentrated on coordinating and facilitating EPA initiatives on agricultural chemicals in ground water with those of other federal agencies.

The Region helped SCS develop three P.L. 83-566 land treatment projects, each of which with significant water quality components. The proposed Upper Tifton Project is a prototype for integrating the P.L. 83-566 and section 319 programs. Under this project, SCS will provide cost-sharing and technical assistance to landowner/operators for soil erosion control, and ASCS will provide cost-sharing assistance for the water quality measures. Technical assistance for the water quality efforts also will be provided.

Working with SCS offices in Indiana, Michigan, and Ohio, the Region completed a survey of tillage practices in the Saginaw Bay and Lake Erie drainage basins. The results will be used to estimate phosphorus load reduction.

The Region also worked with SCS on the hydrologic unit project selection and with the Wisconsin and Minnesota offices on developing a water quality demonstration project.

An urban targeting manual is also being prepared by the Region that will set forth procedures to determine the greatest generators of nonpoint source pollution within specific urban areas. This project will provide guidance for selecting appropriate BMPs for a particular area.

The Region is developing a model storm water management permit for the Rouge River Basin and



● Regional Office

will include language for both interim and final NPDES storm water permits and a prototype permit application. In addition, the Region's Urban Nonpoint Source Control and Storm Water Management Information and Education Project is developing a plan for local education programs. The project expects to create 12 fact sheets that discuss problems, programs, and success stories about urban nonpoint source controls and storm water management. It has scheduled publication for March 1990.

The Region also is participating in a project to assess the use of wetlands to reduce nonpoint source pollution. The Region's contribution to the project is a literature review to document the use of wetlands as a BMP for nonpoint source pollution control.

Regional Highlights

In response to the agricultural community's concern about drinking water quality and the need to provide more useful information about agricultural sources of ground-water contamination, Region V is cooperating with Extension Service water quality specialists in Wisconsin and Minnesota to develop and refine agricultural pollution assessment procedures. The Region will develop fact sheets that explain the Farmstead Assessment System procedures

designed to help farmers identify potential sources of ground-water contamination. The Region also will help farmers set priorities for effective management and structural changes designed to minimize the risk of ground-water contamination.

EPA's financial and advisory support of this project has been extensive. The Office of Ground Water provided financial support to the Wisconsin Department of Natural Resources to develop pollution vulnerability site evaluation criteria. Regional nonpoint source ground-water and pesticide staffers are members of the project's advisory committees. The Great Lakes National Program Office supported initial development of materials for use in the Great Lakes Basin.

Indications are strong that farmers are seeking and will use the Farmstead Assessment System. Region V staff distributed surveys after a drinking water presentation, and 70 percent of the respondents expressed interest in receiving information on farm pollution assessment procedures. Forty-four percent wanted help with conducting a pollution prevention assessment, followed by recommendations for structural and management improvements.

INDIANA

Statewide Activities

Indiana's Department of Natural Resources (IDNR) continued activities under the state *T by 2000* program that addresses the effects of erosion and sedimentation in watersheds throughout the state. The program's lake enhancement component directly addresses water quality concerns.

A variety of organizations work cooperatively under the program to resolve sedimentation and eutrophication problems with volunteer monitoring efforts and public information and education activities. In addition, the 1989 General Assembly enacted a boat tax that is expected to generate at least \$1 million per year; the money will supplement the \$300,000 annual lake enhancement budget. Until now, the state has used these funds primarily for preliminary investigations and feasibility studies; projects on several lakes now will move into design and construction phases.

The *T by 2000* program also addresses erosion from nonagricultural sources. The program provides technical assistance to planners, developers, and local governments to assess soil suitability for non-agricultural uses and to solve development site erosion problems. A number of counties rely on

employees from SCS and the soil and water conservation districts for technical expertise in selecting BMPs to control erosion on development sites.

The Highway Extension Research Project for Indiana Counties and Cities has coordinated the development of a model erosion control ordinance. This ordinance can be adopted by local governments interested in regulating development site erosion. Although the ordinance is not in final form, a number of local agencies have expressed interest in adopting it.

State regulations governing residential on-site sewage disposal are being revised to strengthen controls over the installation of residential disposal systems. Technical and management information will be provided to on-site disposal users to help them protect water quality.

Indiana's Department of Environmental Management (IDEM) will continue its ongoing fish and sediment evaluation program, collecting samples from about 30 stream sites and one lake this year. The data are a valuable discharge monitoring tool and also identify areas in which fish may not be fit for human consumption. The sampling results will help determine where point and nonpoint source discharges are contributing pollutants that accumulate in plants, animals, or the soil.

Watershed Activities

The lake enhancement component of the *T by 2000* program has been remarkably popular. Program funds were designated for activities on 73 lakes. For example, *T by 2000* funds were used on 21 LaGrange County Lakes for preliminary studies by IDEM and local officials. Six lakes from that group were selected for an ASCS Water Quality Special Project. The project will provide \$57,400 in cost-sharing funds for land treatment and other practices to help reduce pollutant loads to the lakes. Landowner reactions to the project have been very favorable. The lakes and surrounding watersheds selected for the study are Oliver, Royer, Fish, Appleman, Adams, and Big Long Lake.

ILLINOIS

Education and monitoring programs are the core of Illinois' nonpoint source management efforts. In fiscal year 1989, educational activities have been augmented by the Illinois Environmental Protection Agency's (IEPA) poster contest and educational packets prepared for teachers.

Illinois water quality monitoring and evaluation efforts include intensive pesticide monitoring, river

basin studies, evaluation of the ambient networks of 208 final stream stations, and a volunteer-run lake monitoring program.

The state has taken a more aggressive stance on toxic pollution, initiating a toxic substance control program and intensive monitoring of toxic pollutants and fish contamination. Illinois also has begun to participate in the Lake Michigan Pollutant Control/Reduction Strategy.

The state maintained its Watershed Tracking System that summarizes the total expenditure of federal, state, and other funds for watershed projects. This system includes a summary of the BMPs in place in specific watersheds and associated reductions in soil erosion. The state also is evaluating six state-funded projects to determine the effectiveness of BMPs on surface water quality.

In addition, the state has adopted agricultural chemical secondary containment regulations that are being considered for inclusion in the Illinois Ground-water Protection Act. Proposed revisions to livestock waste regulations will be presented to the Illinois Pollution Control Board, as will the proposed expansion of the IEPA Pesticide Monitoring Sub-network. Pollution control at construction sites continues to gain attention from both state and local governments, both of whom have used the IEPA Standards and Specifications for Soil Erosion and Sediment Control.

The Northeastern Illinois Planning Commission is preparing to develop a model urban nonpoint source management plan for urban watersheds of less than 30 square miles. It will be based on field evaluations of actual in-stream water quality problems. The Commission also is developing a field handbook for construction erosion control, evaluating pesticide use in urban settings, and helping counties develop storm water management plans.

Several state activities are either continuing or being developed in response to the increased interest in ground-water protection, including:

- monitoring of wells near agricultural facilities for pesticides;
- ground-water data collection and development of comprehensive standards for ground-water quality;
- establishment of state ground-water monitoring networks;
- revision of the Water Use Act of 1983 to restrict ground-water consumption in some Illinois counties; and
- a comprehensive statewide education program.

Illinois took part in revising SCS standards and specifications related to water quality improvement, as well as in the development of new USDA standards and specifications for nutrient and pesticide control.

OHIO

Ohio state agencies carried out nonpoint source control activities ranging from water quality monitoring to land treatment in FY 1989. Although all categories of nonpoint source pollution were addressed in some manner, Ohio focused on agricultural runoff, which had been identified by the state assessment as the major source of nonpoint source pollution.

Statewide Activities

Most of Ohio's nonpoint source programs depend on voluntary activities, which in turn rely on effective education, technical assistance, and interagency cooperation. The state has carried out education and demonstration projects in 33 watersheds and/or counties to test various nonpoint source control approaches. Eight of these projects received over \$112,000 in ASCS special project funds (cost-sharing for BMP implementation), and SCS provided \$20,000 in cost sharing for one project.

Another demonstration project identified sewage system and well water problems. As a result, a group of county commissioners established a sewage loan fund to correct these problems.

The state also prepared several watershed profiles to identify the location and extent of nonpoint source problems and to recommend pollution controls.

The Ohio General Assembly appropriated \$1 million in cost sharing to help introduce water quality BMPs over the next two years in watersheds identified as problem areas by the state nonpoint source assessment. The funds also can be used for additional technical assistance to develop animal waste nutrient management plans.

Although the state has relied primarily on voluntary approaches, Ohio also has initiated several regulatory approaches to nonpoint source control. For example, new rules for livestock waste management approved in FY 1989 increase penalties for polluters. New BMPs also have been specified to prevent over-fertilization and to encourage the proper use of animal waste. In addition, new standards for urban sediment control have been scheduled for public hearing.

Legislation introduced to establish storm water management districts would give the districts the authority to adopt and enforce standards to control soil erosion resulting from grading, excavating, and other land redistribution activities; to manage storm water runoff; and to control sediment from agricultural runoff.

A number of other state programs are instrumental in controlling nonpoint source pollution. For example, the Scenic Rivers Program has established procedures to protect designated scenic rivers in Ohio from nonpoint source pollution. A tax check-off program for natural areas generates approximately \$150,000 annually to purchase conservation easements or make fee-simple purchases of riparian areas and wetlands. A pilot program in cooperation with the soil and water conservation districts and ASCS allows the Scenic Rivers Program to augment Conservation Reserve Program filter strip payments to purchase easements along scenic rivers.

The Ohio Department of Transportation has begun to upgrade existing standards and specifications for erosion control.

The Ohio Environmental Protection Agency (OEPA) has contracted with six regional planning agencies to assist with the nonpoint source program, including public outreach, remedial action plan development, wetland feasibility studies, paired watershed demonstration projects, assessment report updates, participation in the volunteer monitoring program, and development of a homeowner's nonpoint source management guide.

SCS continued to support the state's nonpoint source efforts through P.L. 83-566, RAMP, and the Water Quality Action Plan. Several conservation districts have led local nonpoint source efforts (including the Conservation Action Project) and the development of P.L. 83-566 projects related to water quality issues. ASCS continued to support the state's nonpoint source efforts by funding special small implementation projects, and USGS is helping monitor a number of nonpoint source projects.

Watershed Activities

The Ohio Environmental Protection Agency, in cooperation with other agencies and organizations, is investigating the feasibility of developing an artificial wetland or re-establishing a former wetland to mitigate the effects of phosphorus and other pollutants from agricultural runoff on a northwest Ohio stream. The project is in the developmental phase.

OEPA helped to develop remedial action plans for the Maumee, Cuyahoga, Ashtabala, and Black rivers. Major tributaries of Lake Erie, all are affected by nonpoint and point source pollution. The plans are in the problem identification stage.

MICHIGAN

Michigan's nonpoint source program includes identification of water quality problems, technical assistance, education, incentives, and regulatory programs. The state's Department of Natural Resources (DNR) is the lead agency for the Michigan nonpoint source program.

The DNR is using \$1 million from the state's general fund to support watershed demonstration activities, the Construction Site Training Program, nonpoint source program administration, and the Clean Lakes Program. DNR's ongoing activities include the following:

- working with appropriate agencies and interest groups;
- identifying nonpoint source water quality problems;
- evaluating watersheds to determine which have the most serious pollution problems each fiscal year;
- responding to citizen complaints;
- collecting data and conducting water quality assessments; and
- determining compliance with state water quality standards.

Statewide Assessment Activities

A major activity of Michigan's nonpoint source program in FY 1989 was documenting the impact of nonpoint source pollutants on Michigan lakes and streams. These efforts, which were undertaken to verify information in the state assessment, included the following activities:

- **Conducting 27 biological surveys** to assess the impacts of nonpoint source pollutants on fish, aquatic plant life, macroinvertebrates, habitat, and water quality. A procedure was drafted to evaluate nonpoint source effects on fish and macroinvertebrate communities. This procedure was field-tested at four sites; a final procedure will be available in 1990.
- **Expanding the Fish Contaminant Monitoring Program** to include fish collections from 54 inland lakes. High mercury concentrations found in fish from other lakes prompted the expansion of this effort. Other contaminants also will be monitored.

- **Conducting a pesticide monitoring program** in cooperation with the Michigan Department of Agriculture. Five sites that produce runoff containing agricultural pesticides were selected for monitoring; 12 surface water samples taken at these sites will be analyzed for leachate pesticides.
- **Conducting a biological survey in 1990** on the Days River to evaluate the effects of forestry practices (such as clear cutting) on surface water quality.

Statewide Activities

The Michigan Energy Conservation Program for Agriculture and Forestry is a three-year, multi-agency effort to encourage farmers and foresters to adopt less energy-intensive practices. Financial settlements from court cases involving oil overcharges provide program funding. Practices encouraged in the program include conservation tillage, fertilizer management, integrated pest management, livestock waste utilization, irrigation system evaluation, and forester assistance. The SCS works with farmers to reduce over-application of pesticides, fertilizers, and animal wastes. The program has prompted farmers to cut their use of chemicals by 1,900 tons and has reduced soil erosion by 189,000 tons. Annual fertilizer use decreased by 2,000 tons of nitrogen, 3,250 tons of phosphorus, and 2,720 tons of potassium.

Watershed Activities

- **Sycamore Creek Watershed:** The Sycamore Creek watershed will be a demonstration site for the state-mandated Comprehensive Basin Plan. The state requires the establishment of such plans when state dissolved oxygen standards are violated — either upstream of point source dischargers or downstream of the point source when there is a documented nonpoint source contribution.
- **Clam Lake:** The Michigan Clean Water Incentive Program, the Northwest Michigan Council of Governments, and the Northwest Michigan Resource Conservation and Development Council have developed a nonpoint source pollution control action plan and implementation program for the Clam River Basin. The Clam River and its large basin receive significant nonpoint source pollution from nutri-

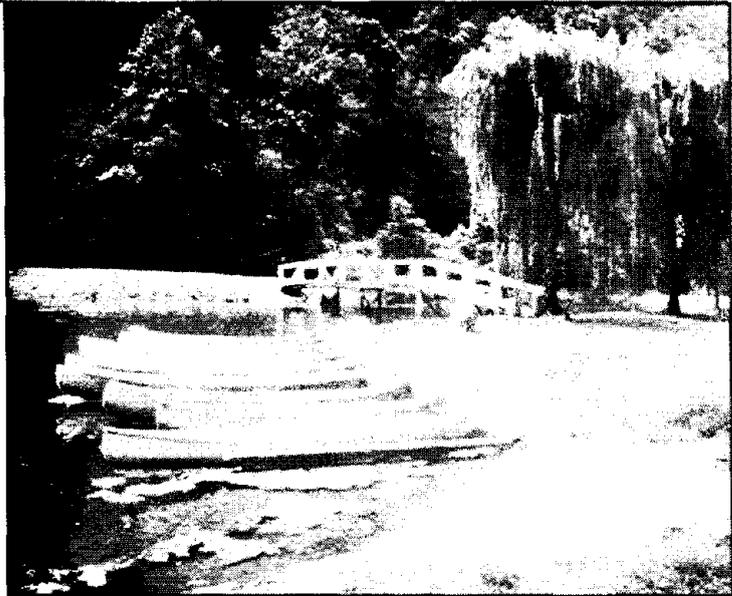


Photo by Jonathan Simpson shows a tranquil lake, with the far shore ripped to prevent erosion.

ents in animal waste, sediments from rural soil erosion, and various contaminants from urban runoff.

The project provides cost-sharing and technical assistance for the implementation of BMPs such as no-till planting, strip cropping, and filter strips. Landowner participation in the cost-sharing program has been excellent. The project also initiated an aggressive education and information program, including a quarterly newsletter; radio, newspaper and TV spots; and one-on-one meetings with landowners in the watershed.

The key to the success of the Clam River project has been interagency cooperation from the beginning. Development of the action plan included formation of a local Watershed Steering Committee to encourage local interest in the project. The Steering Committee is a vital link to local agencies and groups in the basin.

- **Morrison Lake:** The Clean Lakes Program, the Clean Water Incentive Program, and local lake board's tax assessments provide funding for the Morrison Lake Project. The project includes a watershed management plan to reduce phosphorus loading to the lake by 25 percent over three years. The project will identify pollution sources, implement BMPs to reduce sources, and measure BMP efficiency. Conservation plans have been prepared for more than 60 percent of the cropland in the watershed and applied to 15 percent.

Because the watershed is small, project managers met individually with farmers to

provide information and assistance. Newsletters provided information to the entire watershed community and the local newspaper published several articles on the project. The Morrison Lake Project also distributed publications about the use of BMPs.

MINNESOTA

State and local governments in Minnesota play important roles in controlling nonpoint source pollution. The state provides technical and financial support, while local governments and individuals are responsible for implementation.

Statewide Activities

Technical support is a major component of Minnesota's nonpoint source program. The state expanded its Agricultural Nonpoint Source Pollution model (AGNPS), widely used throughout the country, to include urban and lake components and also developed a component to simulate pollutant delivery to ground water. Modifications to the model will provide a better understanding of the nature of nonpoint source pollutants.

- **The Minnesota Pollution Control Agency (MPCA)**, the state's lead nonpoint source agency, is investigating the application of biological criteria to water resource assessment. MPCA has focused its efforts on developing an Index of Biotic Integrity. It also developed a stream habitat evaluation procedure and work sheet for determining a stream's biological use potential.

The MPCA also provides public information and technical assistance. The agency prepared a slide show and video to complement the nonpoint source booklet, *Protecting Minnesota's Waters . . . The Land-use Connection*. The agency has distributed over 15,000 copies of the booklet and also has published and distributed a citizen lake monitoring newsletter and an agricultural BMP handbook. Urban and forestry BMP handbooks should be completed in 1990. MPCA prepared these handbooks with the assistance of SCS.

- **The Board of Water and Soil Resources (BWSR)** has a close working relationship with soil and water conservation districts, which helps promote nonpoint source control activities. The BWSR administers state cost-sharing funds for erosion and sediment control and pro-

vides technical assistance to localities to protect or manage water and land resources.

- **The Minnesota Department of Natural Resources (MDNR)** manages several nonpoint source pollution control programs. It implements BMPs in state forests, parks, and wildlife habitats, and, through its permit authority, on non-state lands as well. For example, BMPs must be implemented on floodplains and shorelands, on construction sites located on beds of public waters, and on public drainage ditches.

Watershed Activities

The Clean Water Partnership Program, established in 1988, is designed to control nonpoint source pollutants through watershed management. The program supplies matching grants and technical assistance to local governments. Funds are used for project development (e.g., water quality assessments and monitoring) and implementation (installation of BMPs and educational activities). The first grant application period opened in September 1988, with the MPCA board funding 14 of 39 projects. Projects include:

- **Lake Bemidji:** This lake and ground-water project (wellhead protection project) includes both rural and urban areas. The project goal is to protect and improve surface water and ground-water quality. It involves detailed chemical, physical, and biological data collection and analyses of surface waters in the watershed. The elements of the project include water quality monitoring, watershed assessment, information and education programs, data analysis, identification of BMPs, and completion of the monitoring plan. The county soil and water conservation district coordinates the project.
- **French Lake:** This project involves a 842-acre hypereutrophic lake with a 3,400-acre rural watershed. Planned activities include assessing farming practices and lake lot activities in the watershed and monitoring lake and tributary water. Project sponsors include St. Olaf and Carleton Colleges, the MDNR and SCS. The project staff has prepared guidance documents describing the watershed and water quality monitoring to assist these and other projects.
- **Minnesota River:** The Minnesota River Assessment Project has received a funding com-

mitment of \$700,000 for two years from the state legislature. The money will fund a cooperative study involving the MPCA, USGS, EPA, SCS, South Central Minnesota Counties Water Planning Project, Mankato State University, BWSR, and MDNR. The project will identify those streams that receive the most nonpoint source loading. That information will enable planners to estimate the load reductions necessary to achieve water quality goals and the money needed to achieve those goals. The information also will help determine where future water quality projects should be conducted.

WISCONSIN

The cornerstone of Wisconsin's nonpoint source effort is the State Priority Watershed Program (PWP) administered by the Wisconsin Department of Natural Resources (WDNR). Since 1978, the state has spent over \$50 million on the program. Most of the funding is used to cost share the implementation of BMPs in priority watersheds.

A comprehensive analysis of nonpoint source pollution in the state's 330 watersheds forms the basis of the program. In addition, Wisconsin has developed both urban and rural watershed models that identify and address the most significant sources of nonpoint source pollution from land management.

Each PWP project has a 10-year life span that includes the initial planning stages, a three-year cost-sharing sign-up period, a five-year installation period, and a final evaluation period.

In addition to the priority watershed effort, Wisconsin has initiated other nonpoint source efforts. For example, in 1987 the legislature enacted a provision to allow the regulation of all nonpoint source pollutants that severely and significantly affect Wisconsin's surface water and ground water.

Statewide Activities

Wisconsin revised its statute and administrative code to coordinate and implement the nonpoint source program, administered jointly by the Wisconsin Department of Natural Resources (WDNR) and the Soil and Water Resource Management Program of the Department of Agriculture, Trade and Consumer Protection (DATCP).

The Wisconsin Coastal Zone Management Program recently solicited applications for nonpoint source pollution control programs. The WDNR will coordinate these projects with the Priority Watershed Program.

The University of Wisconsin Extension and DATCP completed a nutrient and pesticide BMP handbook and summary during FY 1989.

Watershed Activities

Forty priority watershed projects, covering approximately 6,000 square miles, currently are underway in Wisconsin. WDNR selected seven new projects and has completed plans for the Milwaukee River Watershed and the Black Earth Creek Priority Watershed Plan.

- **Big Green Lake:** The PWP has completed the final project evaluation for the Big Green Lake Priority Watershed. The watershed plan, approved in 1981, established a goal of reducing nutrient input to the lake from various nonpoint sources by 40 percent. The original sign-up period for cost-sharing funds ended in 1984 but there was a second sign-up opportunity in early 1988.

The PWP calculated the reduction in pollutant loading for upland soil erosion, animal waste runoff, and gully erosion. The upland soil loss control achieved 41 percent of the watershed plan's goal. The reduction in phosphorus loading from barnyard runoff for the watershed was 75 percent, significantly exceeding the 40 percent goal. This reduction was accomplished through controls placed on 36 of the 111 barnyards in the area. The PWP also estimated that 17 percent of the gully erosion (a small fraction of the nutrient and sediment load to the lake) was controlled by the project.

Water quality goals in the watershed plan included:

- reducing bacteria levels at the lake's swimming beaches,
- increasing average summer water clarity, and
- halting the trend of increasing sedimentation that extends the shoreline.

The evaluation suggested that it is still too soon for the lake to respond to changes in land management practices installed under the project. Any reported water quality variations probably resulted from climatic changes. Changes in the lake's littoral area were not measured, and Secchi disk readings to measure clarity were inconclusive. However, violations of bacteria standards declined from 15 percent in 1984 to 4 percent in 1987.

REGION VI

Region VI worked closely with the states (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas) during FY 1989 to help revise the state assessment reports and management programs and assist them in dealing with nonpoint source program issues.

The regional staff hosted a state workshop on nonpoint source implementation funding and provided guidance on the use of 205(j)(5) funds and 319(h) funds. These efforts resulted in a clearer understanding by the states of the differences between state and federal roles in program development and implementation. The final nonpoint source management programs that received approval reflected that improved understanding.

The Region asked for comments from other federal agencies on the EPA Federal Consistency Guidance and included those comments in its presentation to the workshop. In addition, the regional staff maintains contact with a core group of federal agencies through periodic letters, phone calls, visits, and invitations to other nonpoint source workshops.

The Region also participated in a multi-regional nonpoint source implementation workshop in Nashville, Tennessee. Representatives of states from three regions met to share their successful implementation activities; four Region VI states sent representatives. The participants returned with excellent information about programs in other states. Pennsylvania's manure management program, Maryland's urban program, and North Carolina's cost-sharing program provided a number of ideas that Region VI states incorporated into their management programs. Louisiana's explanation of its Interagency Coordinating Committee (see state summary) also generated considerable interest in the states from other Regions.

The rest of the Region's nonpoint source activities during FY 1989 focused on moving the states beyond program development and into program implementation — specifically, measures that will reduce nonpoint source loads and improve water quality over the next four years of the program. To accomplish this, Region VI concentrated its efforts in two main areas: (1) implementing the Region's funding policy, and (2) approving only implementation-phase state management programs.

The Region's funding policy encourages states to use at least 50 percent of their FY 1988 205(j)(5) funds for program implementation and requires that at least 75 percent of FY 1989 funds be allocated to implementation. While the states did not



achieve the FY 1988 goal, the Region expects that FY 1989 requirements will be met.

Because the Region's ability to influence the scope, direction, and content of state management programs lies primarily in the approval process, the Region took a very literal view of section 319 requirements for granting approval. Implementation measures were the only portions of management programs the Region approved. Consequently, the management programs contain four years of implementation of nonpoint source controls.

The 319 assessments are contained in different documents than the 305(b) report and often contain more information. The Region expects the 1990 305(b) reports to contain all the information currently in the nonpoint source assessments as well as any new data gathered in the interim. The Region has received work plan commitments to accomplish this from most states in section 106 grant applications.

The states still need strong encouragement to work with other data-gathering agencies to develop mutually acceptable quality assurance/quality control (QA/QC) procedures that all agencies can use and benefit from. The Region is working with the other agencies to develop QA/QC procedures and will sponsor a nonpoint source monitoring workshop in FY 1990 that will focus on these procedures.

There are few indications that land management agencies in Region VI are ready to commit significant financial or technical assistance to state management program priorities. Moreover, some state water quality agencies have been slow in passing through section 319 or 205(j)(5) monies to eligible cooperating agencies for actual work.

The Region is encouraging states to direct their water quality monitoring stations away from compliance monitoring for point source discharges and to

ward nonpoint source monitoring. Identification or verification of suspected nonpoint source problems should generate new information to add to 305(b) reports for future nonpoint source assessment updates; the Region has provided two states with Clean Water Act section 106 money for this. The Region gave three states funds from 205(j)(5) to implement monitoring to document water quality benefits of nonpoint source control measures.

While the states have overcome a number of challenges in developing their assessment and management programs, some problems remain. These problems will be addressed in future revisions.

Regional Highlight

Lower Colorado River Authority

The Lower Colorado River Authority (LCRA) operates its own nonpoint source management program. The program consists of a three-phase approach to nonpoint source control:

1. **Education.** LCRA developed the award-winning documentary video *Pointless Pollution*, narrated by Walter Cronkite, to help educate state and federal field personnel. It is distributing the video throughout its area; EPA Region VI is distributing it to other Regions, states, and federal agencies.
2. **Demonstration Projects.** The LCRA, USDA, local soil and water conservation districts, and the Texas Soil and Water Conservation Board have started a rice irrigation return flow demonstration project. Similar projects are planned for the future. LCRA ultimately intends to base its water pricing structure on the quality of water returned to the river.
3. **Performance-based Regulatory Program.** LCRA started a pilot program for performance-based regulations in the Lake Travis watershed, north of Austin, Texas. The ordinance requires developers to meet specific pollutant load limits from their sites. LCRA developed the pertinent BMPs and provides technical assistance to determine which BMPs can best achieve the load reductions. The building permits specify only the pollution load levels necessary to protect water quality.

Even though LCRA began its nonpoint source management program before the enactment of section 319, the program achieves the goals of the Clean Water Act. LCRA continues steady progress in implementing its nonpoint source management program.

ARKANSAS

The lack of personnel and money will continue to limit effective implementation of nonpoint source controls in Arkansas. The state decided to spend its 1987 and 1988 205(j)(5) funds on a nitrate study, and has not clearly indicated how — or even if — it will spend the 1989 allocation. Future implementation activities depend upon the results of the nitrate study.

The state's assessment report identified two sources of nonpoint source pollution: mining and agriculture. The management program contained information on both categories but lacked implementation milestones (especially those addressing water quality).

Arkansas also revised the animal waste portion of the agricultural section of its management program. The animal waste program contains a permit program for dairies, swine wastes, liquid poultry wastes, and a voluntary education/technical assistance program for dry poultry litter.

The programs operate statewide, but more intense efforts are directed to northwest Arkansas where the poultry industry is expanding rapidly. The significant limestone deposits and a large number of sinkholes in the area have created significant problems in surface water quality (nutrients, fecal matter) and possibly in ground-water quality (nitrates).

LOUISIANA

Louisiana's management program is unique to the Region: state and federal agencies (such as the USDA Soil Conservation Service, Forest Service, Extension Service, State Department of Natural Resources, and State Soil and Water Conservation Commission) have agreed to cooperate with the Louisiana Department of Environmental Quality (LDEQ) through an interagency coordinating committee. The committee helps LDEQ set priorities for nonpoint source projects.

The state's nonpoint source problems result from intensive agriculture, extensive hydromodification, and oil and gas exploration and extraction. The surface water is slow, sluggish, and nutrient-rich; hydromodification by both private and government interests has significantly altered its chemical and physical properties. Urban problems are emerging, especially in New Orleans, which stands below sea level and is artificially drained.

With the help of the committee, LDEQ has started a multi-phase nonpoint source management

program to address priority areas. The state has targeted two basins for agricultural controls: the Tangipahoa and the Mermentau.

To restore the Tangipahoa River, which has been closed to fishing and swimming because of high fecal coliform rates, LDEQ has initiated a pilot program to grant permits for waste management systems. SCS is providing technical assistance and ASCS is cost sharing the construction of lagoons and other remedies through its special water quality fund. To prevent the lagoons from contaminating the ground water (which will occur if the clay content of the soil is insufficient), LDEQ is providing field oversight through funding from an EPA grant during construction of each lagoon.

The Mermentau Basin contains a project that demonstrates the effectiveness of new SCS BMPs for rice irrigation. This project (funded by EPA) tests the BMPs on Extension Service field plots. SCS chose the site for its hydrologic unit technical assistance project; ASCS is expected to provide cost-sharing funds. Through an EPA grant, LDEQ also is demonstrating the benefits to water quality from replanting stream banks.

LDEQ expanded its 401 certification procedures to allow the nonpoint source staff to review revisions and conditions for new 404 permits. These conditions require a modified side slope to allow natural plant growth. LDEQ expects that these conditions will decrease turbidity, total suspended solids, metals, and pesticides (which were previously absorbed into eroding channel banks).

With the exception of the pilot permit program and the 401 process, nonpoint source management efforts in Louisiana are voluntary. LDEQ and cooperating agencies are escalating education. The state is committed to evaluating the effectiveness of all management program activities to reduce nonpoint source loads and improve water quality and to modifying the program and/or BMPs if proven ineffective.

LDEQ also is expanding nonpoint source standards to include nutrients and is modifying ambient water quality trend stations to evaluate the effectiveness of nonpoint source controls.

NEW MEXICO

New Mexico's arid climate creates an extremely fragile environment; change or improvement is slow once damage occurs. For example, the Ojo Sarco Acequia in the Rio Embudo Watershed has repeatedly overflowed its channel over the last 50 years,



*Overgrazed and eroded arid rangelands in New Mexico.
Photo by Ann Beier.*

creating a canyon-like gully. The Forest Service, SCS, and the New Mexico Environmental Improvement Division are cooperating on a demonstration project to prevent future erosion and repair the present damage. The project involves moving massive amounts of soil, installing an erosion-preventing fabric, and developing and implementing soil conservation plans for private landowners in the watershed. This is one of four demonstration projects designed to improve the quality of New Mexico's water.

Most of New Mexico's water quality problems result from intense grazing and timbering in high quality coldwater fisheries. Many of the problem areas are located on federal land controlled by the Bureau of Land Management and the Forest Service. Significant nonpoint source loads also originate on privately held land in the area.

The New Mexico State Nonpoint Source Task Force, made up of state and federal land management agencies, will help secure voluntary implementation of its nonpoint source management program. The state has revised its 401 certification procedures to allow the nonpoint source staff to perform reviews. This change has resulted in modifications, conditions, and the attachment of remedial requirements to the certifications and subsequent 404 permits.

New Mexico is particularly concerned about the need for a strong federal consistency review. Negotiations with federal agencies have not resulted in satisfactory environmental protection on the large amounts of federal lands in the state. Activities of the U.S. Department of Transportation and the Federal Energy Regulatory Commission concern the state most. A strong federal consistency policy would significantly affect the water quality of New Mexico.

OKLAHOMA

To combat nonpoint source pollution in Oklahoma, the Oklahoma Conservation Commission is relying on voluntary BMP implementation in targeted watersheds. The Commission is providing educational and technical assistance and using section 319 funds to cost share small watershed demonstration projects.

The state's first demonstration project, located in the Battle Branch sub-watershed, addresses fecal coliform and nutrient loads. The project is designed to demonstrate the effectiveness of BMPs in managing animal waste and carcass disposal, as well as the state's ability to administer a cost-sharing program. A state program provided the matching funds for the demonstration projects.

The Oklahoma State Department of Agriculture (OSDA) administers a statewide regulatory program that includes permitting, inspecting, and compliance monitoring for the storage and distribution of fertilizer (commercial and organic) and pesticides. This program recently was revised to reflect the need for actions to improve water quality. OSDA has made a commitment to evaluate how effectively these programs improve and/or protect water quality and reduce nonpoint source loads. It will revise the programs if they prove ineffective.

Oklahoma's assessment report contained both monitoring and evaluation information from a wide variety of sources, including the Oklahoma Conservation Commission's own high-flow data. The report identifies nonpoint source impacts from almost every category.

TEXAS

The Texas Nonpoint Source Management Program addresses ground-water, agricultural, and silvicultural problems in various ways.

- **Ground Water:** Under the ground-water component, state agencies that belong to the Ground-water Protection Committee implement ground-water BMPs that are then tracked and evaluated by the Texas Water Commission, the lead agency. A modification of the wellhead protection program also specifies a four-step implementation of that program:

- inventoring the area for sources of contamination,
- preparing a formal report with recommendations to the governing authority (i.e., city council),
- tracking the implementation of these recommendations by the responsible entity (city council, county commissioner, etc.), and
- evaluating the effectiveness (water quality protected, nonpoint source load reduced) of the voluntary program, with modifications to improve it.

Seventy-five cities and counties are now participating in this ground-water program. A portion of the effort is supported by EPA grants.

- **Agriculture/Silviculture:** The agricultural/silvicultural component of the management program is basically voluntary in nature. Water quality BMPs are encouraged through technical assistance and educational efforts by the State Soil and Water Conservation Board (the lead agriculture agency), SCS, and Extension Service.

Two areas in the state are targeted for intensive help:

- North Bosque River (Erath County — dairy wastes) and
- Southern High Plains (arsenic in ground water).

Erath County, the state's top priority, has a series of demonstration projects to show proper design, operation, and maintenance of animal waste management systems (lagoons and land application), and the economic advantages of using water quality BMPs for wash water. These demonstrations and the expanded educational effort are supported by EPA funds. The area has applied for SCS hydrologic unit technical assistance and ASCS special water quality funding.

The state's agricultural/silvicultural program has become considerably stronger over the past year, clearly demonstrating that over the long term it will improve water quality and reduce nonpoint source loads.

REGION VII

Nonpoint source pollution caused by agricultural activities is the major focus of Region VII nonpoint source control projects. State programs also emphasize agriculture as a priority nonpoint source category. Agricultural chemicals and animal wastes are pollution sources that need particular additional attention.

The regional staff helped the states (Iowa, Kansas, Missouri, and Nebraska) prepare assessments and management programs. The Region established specific milestone requirements for all states to ensure timely preparation of the reports and programs, and the regional staff met with all state nonpoint source staffs to discuss the progress of management program preparation.

Most of the states had trouble preparing material for the assessment reports. A lack of watershed data and a short amount of lead time made it difficult for them to identify the impact of nonpoint source pollution on surface water and ground water.

The lack of specific watershed information also hampered the states' efforts to determine priorities for the management programs. Most of the states need to refine their nonpoint source assessments to better determine what actions need to be taken and when. This will occur at the same time limited implementation goes forward in those watersheds where nonpoint source problems have been identified.

In any case, the Region and most of the states agreed that better statewide education and information transfer should be given high priority. Unfortunately, the agencies that in the past have provided educational, technical, and financial support lack funds to initiate new efforts. However, some opportunities for cooperative efforts exist, and Region VII is impressed by the willingness of some federal and state agencies to undertake cooperative efforts aimed at outreach as well as projects.

Region VII has been particularly successful at coordinating technical activities with a number of state and federal agencies, including:

- Sponsoring a Pesticides in Ground-water Workshop in December 1988 with representatives from all four states' environmental and agricultural agencies.
- Conducting a series of workshops on the use of the Agricultural Nonpoint Source model (AGNPS). Following the workshops, several participants have applied the model to projects in their states.



● Regional Office

- Working with SCS on EPA's effort to integrate the best features of AGNPS with the emerging technology of Geographical Information Systems (GIS). With SCS technical and field support, EPA has produced several generations of maps of the Cedar Creek Watershed in Bourbon County, Kansas. The maps clearly communicate agricultural nonpoint source concepts to owner/operators and can be a predictive modeling tool to design effective pollution control management plans.
- Developing a pollution prevention project that demonstrates ways to eliminate or control nonpoint source problems. The project incorporates nutrient and pesticide management, better and more detailed soil information, and more efficient application practices to reduce the volume of chemical inputs and thus the amount of pollutants available for runoff or leachate. The Region will conduct pilot projects over the next several years to demonstrate how these pollution prevention principles can reduce impacts on the water quality and maintain yields.

Regional Highlights

- **Big Spring Basin Demonstration Project:** This comprehensive interdisciplinary project in northeast Iowa is designed to track the fate of agricultural chemicals and devise methods to prevent or reduce their movement to ground water and surface water while still maintain-

ing the farmer's profits. A consortium of federal, state, and local government agencies, universities, and agribusinesses developed the project proposal, and a core group manages and tracks the activities.

Several state and federal agencies are funding the project. At the state level, the 1987 Iowa Ground-water Protection Act provides funds for Big Spring. At the regional level, EPA has funded the project since 1986 and will continue to support those project areas not covered by state funding.

On-farm demonstrations, now in their third crop year, have shown that average farm input costs can be reduced by \$3,000 to \$4,000 per year. In early 1989, 52 percent of the farmers involved in the project reported reductions in the use of nitrogen, phosphorus (39 percent), and potassium fertilizer, and a 23 percent reduction in pesticide use. At the same time they reported higher crop yields.

Outreach has been an important part of this project and the Region has cosponsored the production of a video that can relate the project's findings to a larger audience.

- **Integrated Farm Management Demonstration Project:** The Integrated Farm Management Demonstration Program, funded by oil overcharge and oil stripper well funds through FY 1992, involves a series of projects aimed at promoting adoption of the best available techniques for managing farm chemicals. The major goal of the project is to develop non-regulatory programs that encourage management of farm chemicals for environmental protection, energy conservation, and farm profitability.

Since the project started, methods that focus on energy efficiency and environmental improvement have been demonstrated in every county in Iowa. During the 1989 crop year, more than 300 sites with over 5,000 plots demonstrated alternate tillage practices, soil nutrient testing, chemical treatment reduction, and the economic benefits of such practices.

Newsletters, news releases, field days, and special tours are helping get the story out to the public. In addition, the University of Northern Iowa has developed ground-water environmental education teaching modules for elementary, junior high, and senior high schools. The materials have been well received and are being used now in the Iowa school system.

Further Actions

Additional water quality standards criteria are needed to measure and judge the effects of nonpoint source pollution on surface waters. Although EPA has developed aquatic life advisories for some modern pesticides, the development of formal criteria under section 304(a) of the Clean Water Act has been delayed, in part because of an inadequate database. Formal criteria for the most heavily used pesticides and for clean sediment would help the states determine how well uses are being attained even though difficult duration/frequency issues exist because of the flow-variable nature of nonpoint source pollution.

Any effort to determine the extent to which water use is impaired by nonpoint source pollution, and the extent to which BMPs improve water use is necessarily complex. Such complexity underscores the need to use biological criteria in state and local nonpoint source management program evaluations. The use of such criteria involves formal assessments of biotic communities and the designation of reference stream segments from which to determine water use impairment and improvement. Rapid bioassessment techniques may help states implement biological criteria to develop water quality standards and plan nonpoint source control programs.

The Region expects a rapid increase in the number of small watershed projects with focused and accelerated funding for BMP implementation. Past experience indicates that the demand by landowners for technical assistance can easily outstrip the ability of federal, state, and local agencies to provide such assistance. Programs should place particular emphasis on getting specific information to landowners in a timely manner — and budgets should reflect this emphasis. This is especially important in areas where several watershed projects may be started and the available technical assistance can quickly be overwhelmed.

Also needed is more effective guidance for watershed managers who are working with section 319 projects. The ability of the state to provide such guidance in a timely manner often ensures the success of small watershed projects; unfortunately, the expected proliferation of watershed projects may constrain the states' ability to offer such assistance.

Although several national initiatives have established a framework for measuring the environmental effects of nonpoint source pollution, the states need to better understand these measurements and test them under actual field conditions. The federal government can help improve the states' understanding of environmental monitoring methods. A national set of standards for measuring the effects of nonpoint source pollution could be espe-

cially helpful. An example of such a standard might be a hydrologic unit type of analysis that is used by every government agency that addresses nonpoint source pollution.

IOWA

Although Iowa did not have an approved nonpoint source management program in FY 1989, cooperation among state and federal agencies is providing the momentum necessary to start and maintain a number of projects. Participating agencies include the Iowa Department of Natural Resources (IDNR), the Iowa Department of Agriculture and Land Stewardship (DALs), the Cooperative Extension Service, Iowa State University, SCS, ASCS, and EPA.

Statewide Activities

Outreach activities are a key component of Iowa's nonpoint source control program. Through field days and special tours, over 3,800 people — including representatives from at least five foreign countries — have visited the Big Springs project in the past 18 months. In 1988, more than 60 magazine and newspaper articles were published, the project was featured in 30 radio interviews or announcements and nine TV appearances, and five issues of the newsletter *Water Watch* were sent to an 800-person mailing list.

In addition to the ongoing activities under the Integrated Farm Management Demonstration Program and Big Spring Basin Demonstration Project described earlier, the Iowa legislature appropriated \$600,000 to establish at least five Model Farm Demonstration project areas similar to the Big Spring project. The legislation states that the projects are to be designed to enhance the profitability and decrease the environmental impacts of row crop production. Planning for these projects has been completed, with work slated to begin in the 1990 crop year.

The Water Protection Fund, another legislative mandate, authorizes water quality projects to protect the state's surface water and ground water from point and nonpoint sources of contamination. The fund has two accounts: one to pay for projects and one to pay for cost-share practices. In 1989, eight projects were funded for a total of \$500,000; several of these tie in with ongoing projects, thereby extending their effectiveness.

The Resource Enhancement and Protection Act was enacted in 1989 to protect and enhance Iowa's natural and environmental resources. The Act provided funding of \$15 million for 1989, with \$350,000

designated for conservation education and \$3 million for soil and water conservation projects. In 1990, REAP will provide \$1 million for Water Protection Fund projects. Another \$2 million will be used by soil and water conservation districts to implement watershed and chemical management practices designed to improve water quality.

Watershed Activities

A variety of state and federal funding sources helped ensure considerable progress in BMP implementation during FY 1989. In the watersheds of 14 publicly owned lakes (totaling 109,276 acres), BMPs such as conservation tillage, crop rotations, strip cropping, contour farming, fertilizer management, integrated pest management, animal waste management, and structural installations were implemented to control sediment, nutrients, and pesticides from agricultural sources.

Approximately \$113,757 in federal, \$305,965 in state, and \$700 in local funds were used to leverage an additional \$140,134 from landowners for installation of structural BMPs in the 14 watersheds. Sources of funding for the BMPs included the Iowa Publicly Owned Lakes Program, the Clean Lakes Program, ASCS ACP Special Program, and the Rural Clean Water Program (RCWP).

BMPs to control sediment and pesticides from agricultural sources were implemented in the North Cedar Creek trout stream watershed. Funding was approved for two more trout stream watersheds: Glovers Creek and Little Turkey Creek, where work is to begin in FY 1990.

Water quality and watershed conditions/problems are being analyzed for 29 lakes under a Clean Lakes Program Phase I grant awarded in FY 1989. Protection and restoration needs will be assessed for each lake. Two new Clean Lakes projects that involve nonpoint sources were initiated (Lake Ahquabi Phase II and Upper and Lower Pine Lakes Phase I). The Lake Iowa and Green Valley Lake projects were completed.

Water Quality Improvements

Nonpoint source pollutant load reductions have been documented throughout the state. Data for the Prairie Rose RCWP indicate soil losses within the watershed have dropped 65 percent, while sediment delivery to the lake fell from an annual rate of 26,300 tons to 9,400 tons over the life of the project. The Green Valley Lake Clean Lakes project reduced total phosphorus concentration 75 percent, algal growth fourfold, and sediment delivery to the lake by half; at the same time, fish growth rates increased.



Mulch conserves moisture and smothers weeds in this conservation-tilled field; low-till reduces runoff and erosion.

Funding Summary

IDNR expected to use \$131,704 in 205(j)(5) funding to support nonpoint source pollution control in FY 1989. This funding was used primarily for developmental work related to the assessment report, management program, annual report, and implementation projects previously described. In addition, IDNR developed a slide-tape that discusses Iowa's surface water and ground-water quality problems. The slide-tape will be used for SCS water quality meetings.

KANSAS

Statewide Activities

Because EPA only recently approved the Kansas assessment and management program, no BMPs have been installed as a direct result of the management program. However, the state is conducting two targeted nonpoint source water quality assessments that will lead to nonpoint source pollution control projects. The state also has several plans for specific nonpoint source problems; one plan is to correct atrazine contamination and two others are for watershed protection for water supply lakes.

New legislation, regulations, and rules allow the state to establish Pesticide Management Districts, require certification for a chemigation permit, and authorize the promulgation of rules pertaining to spill containment and cleanup at bulk fertilizer facilities.

With the help of SCS and the Cooperative Extension Service, the state also conducted six workshops for district conservationists and county extension agents on nutrients and pesticides.

In addition, Kansas has formed Agency Participation Agreements with 13 federal or state agencies, drafted a registry of nonpoint source control practices and an inventory of valuable waters, and prepared criteria for identifying vulnerable waters. Kansas took a significant step toward achieving self-sufficiency in water programs by earmarking revenues for programs recommended by the Kansas Water Plan (the state planning process). Of the \$15.8 million allocated, \$1.5 million has been targeted for the Nonpoint Source Pollution Control Fund and another \$14.1 million has been reserved for programs and projects that may contribute to nonpoint source pollution control.

Water Quality Improvements

Because its management program was developed very recently, Kansas has not been able to document any reduction in nonpoint source pollutant loads or improvement in water quality. Kansas would like EPA to help state scientists better understand the relationships between biological observations and nonpoint source pollution concentrations and to develop technology-based solutions as initial steps in nonpoint source control.

Funding Summary

Kansas used \$66,000 of 205(j)(5) money in FY 1989 to develop its assessment report and management program. The state received \$207,320 in 205(j)(5)

money to apply to the FY 1990 nonpoint source work effort.

MISSOURI

Watershed Activities

More than 70 watershed-level projects designed to improve the quality of water impaired by nonpoint source pollution were underway in Missouri in FY 1989. All of the projects were listed as priorities in the state management program.

Most of the projects deal with agricultural causes of nonpoint source pollution. Typical BMPs include terraces, grassed waterways, water impoundments, conversion of cropland to grassland, no-till or conservation tillage, and animal waste management systems. Most of the affected waters are streams or rivers, although some lakes also are involved.

Specific watershed projects:

- **Woods Fork Watershed:** This five-year, multi-agency project encompasses the 33,500-acre watershed of the Woods Fork, headwaters for the Gasconade River. Land use consists of forest and pasture with a concentration of dairies.

The project's goal is to protect water quality by improving pasture management/soil erosion control and animal waste management systems. Participants in the project include local, state, and federal agencies; more than \$1 million is being spent.

Fiscal year 1989 activities include construction of animal waste management systems, purchase of irrigation equipment for land application of animal wastes, improved pasture management, ground-water monitoring and surface water studies, and production of educational materials for information transfer.

- **Spring Fork Lake:** This project has linked an EPA-funded Clean Lakes Phase I study with a Missouri Department of Natural Resources (DNR) Special Area Land Treatment (SALT) project to determine current conditions for the lake and watershed and develop practical methods for lake protection/restoration, including reducing soil erosion. The Clean Lakes study will generate lake and watershed data

along with computer-simulated nutrient/sediment loading rates (using the AGNPS model) from SALT projects. Following the Clean Lakes study, watershed controls will be achieved by implementing soil erosion practices under the SALT program. Although the project began before the management program was completed, activities are consistent with the program's objectives.

- **Bootheel Precise Application Project:**

This project is designed to demonstrate that agricultural chemicals can be applied more precisely than most farmers generally do. The project divides an entire field into smaller units by using base maps of agricultural lands. The maps address soil type, texture, organic matter, fertility, and water handling capacity. Recommendations for fertilizer and pesticide applications will be made based on the soil conditions reported on the maps.

Longer-term project objectives include use of the base maps to define even smaller areas within fields (five acres) as a new generation of computerized spreading and spraying machines equipped with satellite navigational systems becomes available. When the three-year demonstration ends, farmers and agribusinesses will fund future expansion of the project. Project planning and initial field work have been completed. Digitalization of the field data is underway, and the project is ahead of schedule.

Water Quality Improvements

Because of insufficient data, no water quality improvements have been documented from Missouri's projects. The long lead time generally required before water quality improvements can be measured has forced many of Missouri's projects to rely on indirect measures of success such as decreased fertilizer or pesticide application and numbers of animal waste management systems. Water quality monitoring over a long period will be necessary before definitive changes can be noted.

Funding Summary

Dollars committed to the watershed projects include \$254,000 of 205(j)(5) money statewide. On a watershed basis, USDA funds account for \$450,000; Missouri DNR funds, \$81,000; 205(j)(5) funds, \$70,338; 314 funds, \$23,000; and match from various sources, \$159,000.



While cows cool off in this stream, they contribute undesirable nutrients and pathogens to the water.

NEBRASKA

Statewide Activities

Nebraska's Nonpoint Source Task Force, a multi-agency group with representatives from the SCS, Corps of Engineers, EPA, ASCS, USGS, Extension Service, and their state counterparts, continues to meet and develop specific aspects of the management programs.

The Task Force has developed a Wellhead Protection Program and has recommended designation of two Special Ground-water Quality Protection Areas (two more are under study). In addition, the Task Force has implemented a statewide chemigation program in response to nitrate and pesticide pollution.

Nebraska has designated approximately 70 federal, state, and local programs for consistency review in FY 1990.

Watershed Activities

Nebraska continues to be involved in the Long Pine Creek RCWP project. Located in north central Nebraska, this project involves the installation of sediment control measures to protect one of the state's trophy trout streams.

The state started two Clean Lakes Phase I projects that involve seven lakes: Branched Oak,

Pawnee, Holmes, and Wildwood Lakes in Lancaster County; Meadowlark Lake in Seward County; Willow Creek Lake in Pierce County; and Maskenthine Lake in Stanton County.

Water Quality Improvements

Insufficient data have made it impossible for Nebraska to document any reductions in nonpoint source pollutant loads. The state now is in the fourth year of an ambitious five-year segment delineation process where not only water quality is characterized but aquatic biota and habitat are also measured. When complete, this process will ensure that water quality effects and causes are better understood, which in turn will mean more effective control of nonpoint source pollution.

Nebraska also has begun to make entries into EPA's Waterbody System. Current legislation gives the state authority to control pollution in 15 nonpoint source categories or sub-categories.

Funding Summary

Nebraska used \$117,500 of 205(j)(5) money in FY 1989 to develop a nonpoint source management program. The state also will receive \$100,000 of FY 1990 205(j)(1) money, of which \$40,000 will be passed through to regional planning councils. Of 604(b) funds, \$100,000 will be applied to achieving state nonpoint source control goals.

REGION VIII

During FY 1989, the Region VIII staff focused on helping the states in the region (Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming) integrate the proposed USDA 1990 Water Quality Initiative, the EPA and USDA initiatives on agricultural chemicals, and the successes of the South Dakota and Utah Rural Clean Water Program projects into strong agricultural nonpoint source management programs as specified under section 319 of the Clean Water Act.

Specific activities included:

- Convening an EPA/USDA/state water quality staff/state agricultural staff conference on pesticides in ground water;
- Supporting the South Dakota Cooperative Extension Service effort to expand its pesticide applicator certification training course;
- Establishing a Regional Agricultural Chemicals Task Force to facilitate data sharing, ensure integration of EPA and USDA programs, connect the various program grants, and ensure a unified approach to dealing with agricultural chemical issues;
- Managing a contract to consolidate the state-of-the-art knowledge on grazing BMPs in the western United States. The first document to be produced under the contract identifies those BMPs that work to address water quality concerns and those that do not and shows how fisheries can be protected at the same time livestock production is enhanced. A second document will show range specialists and ranchers how to implement successful BMPs both as section 319 demonstration projects and within programs conducted by other government agencies;
- Developing and implementing projects using 201(g)(1)(B) funds in Colorado and South Dakota;
- Supporting the states' adoption of compatible silviculture practices based on the Forest Service Soil and Water Conservation Practice Handbook;



● Regional Office

- Supporting Colorado's effort to develop hard-rock mining BMPs for abandoned high country gold and silver mines and tailings (demonstration projects are now underway); and
- Supporting efforts to translate the learning experiences from the National Urban Runoff Project into pilot demonstration projects.

The end result of all this activity is that Region VIII has six approved nonpoint source assessments and management programs. Demonstration projects already are being established from various sources of funding such as section 201(g)(1)(B). The region is ready to begin a full-scale section 319 program.

Regional Highlight

Oakwood Lakes, South Dakota — Poinsett RCWP Project

This RCWP project is the first major national ground-water nonpoint source study to include monitoring of both soil and ground water. Begun in 1981, this 10-year effort is designed to determine the impacts of agricultural BMPs on ground water and surface water, but the ground-water aspects are unique both within RCWP and in the nation.

With its combination of plot, field, and watershed study sites, this project continues to provide information on surface water and ground-water quality, and the relationships between surface waters and ground water in the watershed. The following describes activities in FY 1989 and the major scientific findings to date.

FY 1989 Progress

BMPs employed in this 106,000-acre watershed consist mainly of conservation tillage, fertilizer management, and pesticide management. These BMPs are designed to solve the major problems in the watershed: eutrophication in surface waters and nitrate and pesticide contamination of the aquifer.

Monitoring continued on the Oakwood Lakes System Study, the Agricultural Chemical Leaching Study, and field sites. Several additions were made to the monitoring program in each area.

Ground-water monitoring continued through 1989 at six farmed field sites and the unfarmed Oakwood park site. Well sampling was increased to better define the movement of pesticides and nitrates into the ground water. This was also the first year of monitoring the epoxy resin wells to detect pesticides.

Findings

A comprehensive report on the Oakwood Lakes-Poinsett RCWP project will be made in 1991. Selected findings are presented here as a basis for recommended actions to protect or reduce water contamination. In many cases, a complete analysis of the data has not been made and recommendations are based upon judgments and inferences from the monitoring data.

- Of 2,411 samples collected from monitoring wells ranging in depth from 7 to 65 feet, concentrations of nitrate as N did not exceed 5 mg/L at depths greater than 20 feet below the water table.
- Three geological settings (geozones) have been identified with consistently high concentrations of nitrate as N: (1) shallow sand and gravel with thin topsoils, (2) sand/silt alternating layers, and (3) shallow weathered till.
- Concentrations of nitrate as N found in the water samples are statistically greater under farmed sites than under an unfarmed site.
- The fate of pesticides in the ground water is currently unknown; however, 84 percent of the

pesticides found were not found the following month. This indicates rapid degradation or dilution below detection limits.

- Nearly 75 percent of the pesticides were detected from May through August; this corresponds to the time of application or shortly thereafter.

Recommendations

- To reduce shallow aquifer contamination, fertilizer management systems should be employed when farming over sand and gravel aquifers with overlying weathered till or thin topsoils.
- A combination of high fertilization and no-till management would not be recommended in areas where thin soils overlie shallow, unconfined aquifers used for domestic drinking water. An evaluation needs to be made on a site-specific basis to determine the impacts this may have on surface versus ground-water quality.

These are only a few of the scientific findings and recommendations made by the RCWP evaluation team. Others address the soil profile, BMP effectiveness, and surface waters. In addition, several findings and recommendations have been made regarding monitoring protocols, land treatment, project administration, and information and education activities. While this project has had successes as well as failures, it is clearly on the cutting edge of the discovery of linkages between BMPs, surface water, the soil profile, and ground water.

COLORADO

Region VIII approved Colorado's nonpoint source management programs for agriculture, silviculture, abandoned and inactive mining, urban runoff, and construction runoff in May 1989. The state submitted a program to control nonpoint source pollution caused by hydrologic modifications and the management program was fully approved in December 1989.

The Colorado Water Quality Commission requested and received the governor's approval to use the governor's discretionary fund for nonpoint source purposes. This fund, established in section 201(g)(1)(B) of the Clean Water Act, allows up to 20 percent of each year's construction grant allocation

to be used for section 319 nonpoint source programs. In FY 1989, \$300,000 was dedicated to nonpoint source control. The governor approved a full 20 percent of the construction grant allocation for nonpoint sources in FY 1990 to be used over a three-year period. This is a significant step that allows Colorado to pursue implementation of demonstration projects and educational programs on a priority basis. Eight projects, funded at a 60/40 matching level, began during FY 1989.

Statewide Activities

- **Streambank Erosion Control Education Program:** The Colorado State Soil Conservation Board and the Colorado Association of Soil Conservation Districts sponsored this program to educate the agricultural, mining, urban, and construction communities regarding low-cost measures to control streambank erosion. A symposium was held in the summer of 1989 in Aspen, Colorado, to inform the public regarding low-cost BMPs to control this pollution source. A *Streambank Erosion Handbook* and a color brochure on alternatives for treating streambank erosion will be prepared as a result of the symposium and made available to the general public.
- **Irrigation Management Education Program:** The Northern Colorado Water Conservancy District has expanded the scope of its current irrigation management service to include both the financial and water quality benefits of sound irrigation and fertilizer application. Water quality monitoring of the applied irrigation water, of soil and water samples from the crop root zone, and of water samples from sub-surface agricultural field drains will be used to estimate fertilizer losses to deep percolation and runoff. These losses will be compared to losses expected under best practical irrigation management technologies. Milestones include completion of three field demonstrations and publication of a summary report in early 1990. The report will be distributed statewide and a public meeting will review and summarize the project.

In addition to the activities encouraged by section 319, a number of agencies at the federal, state, and local level are planning nonpoint source improvements. For example, SCS and the Extension Service have entered into an agreement to guide the activities of both agencies in developing materials and training aids for improving water quality.

Watershed Activities

- **Peru Creek/Pennsylvania Mine Demonstration Project:** The Pennsylvania Mine is the largest of several abandoned mines and is the major source of heavy metals in the Peru Creek basin, a tributary to the South Fork of the Snake River. Peru Creek is acidic with elevated concentrations of heavy metals year-round. Of particular concern are the high springtime concentrations of heavy metals apparently caused by the erosion of bare, un-vegetated mine dumps and mill tailings. Metal concentrations at most testing sites remained well above levels considered toxic for sensitive trout species over the course of the entire sampling season.

The project, which is conducted by the Colorado Mine Land Reclamation Division, includes the removal of metals and acidity from the Pennsylvania Mine Drainage. A demonstration treatment system that combines a neutralization system, a sedimentation system, and a constructed wetlands system comprises the cornerstone of the project. Funding is derived from the Abandoned Mine Land Act funds and section 201(g).

- **Gamble Gulch/Perigo Mine Demonstration Project:** Both the Perigo and Tip Top mines contribute to water quality problems in Gamble Gulch, a tributary to the South Fork of Boulder Creek. The 39-acre Perigo mine and wastes are situated on the west side of the stream, while mine tailings are mounded on the east side. The Tip Top mine contributes heavy metal pollution to Gamble Gulch, largely through a collapsed adit.

The Mine Land Reclamation Division is also conducting this project, again using Abandoned Mine Land and section 201(g) funds. Treatment plans include a multi-tiered wetland located well above stream level near the collapsed Tip Top adit. It is anticipated that this project will allow brook trout to return to Gamble Gulch.

- **Milk and Alkali Creeks Demonstration Project:** These two tributaries to Eagle River exhibit both high salinity (1,000 mg/L average during low flows) and high sediment concentrations (up to 12,000 mg/L in spring runoff), resulting in substantial impact to the Eagle River fisheries. Seventy-five percent of the steep Milk Creek watershed is BLM-managed public land, while 48 percent of the Alkali Creek watershed is public land. The project

area is confined to the lower central part of the two drainages.

- **The Eagle River Council** (project sponsor) focuses on private land while public lands are targeted for treatment on a priority basis. A series of drop structures and check dams are being installed to control sedimentation and rejuvenate riparian areas. It is anticipated that the project will greatly reduce sediments and salinity in the Eagle River, thus improving the fishery.
- **Boulder Creek Demonstration Project:** The city of Boulder sponsored this project to treat 2 of 23.6 miles of Boulder Creek needing riparian zone and in-stream treatment. The physical habitat and water quality in this section of Boulder Creek are affected by agricultural activities, particularly grazing. Implementation will include revegetation, fencing, and streambank stabilization.
- **Shop Creek Demonstration Project:** Urban runoff into Shop Creek is the primary source of phosphorus loading into Cherry Creek Reservoir where aquatic life and recreational uses are affected by eutrophication. Storm water runoff drains from the approximately 640 acres of residential development to Cherry Creek Reservoir.

Implementation in this 640-acre residential area includes several phosphorus control facilities. A wet pond of approximately 8 acre-feet acts as the primary control to treat both base flows and storm flows. This pond is followed by a series of drop structures, which create wetlands in the reaches between the structures. Channel stabilization achieved by the drop structures will stop further erosion and channel degradation. Local funding sources have supported this effort.

Under the direction of the Cherry Creek Basin Authority of the city of Aurora, this project should reduce phosphorus in the Shop Creek drainage by approximately 70 percent, to 400 pounds per year. This compares to 5,796 pounds per year projected for the year 2010 without controls. Lessons learned from this project can be used to refine design criteria basinwide, resulting in more cost-effective controls.
- **Soda Creek Demonstration Project:** Aquatic life and recreational uses of Dillon Reservoir are affected by excessive phosphorus loading from golf courses, agricultural

sources, residential areas, and other sources. Urban runoff from the Soda Creek sub-basin is a significant contributor to this problem.

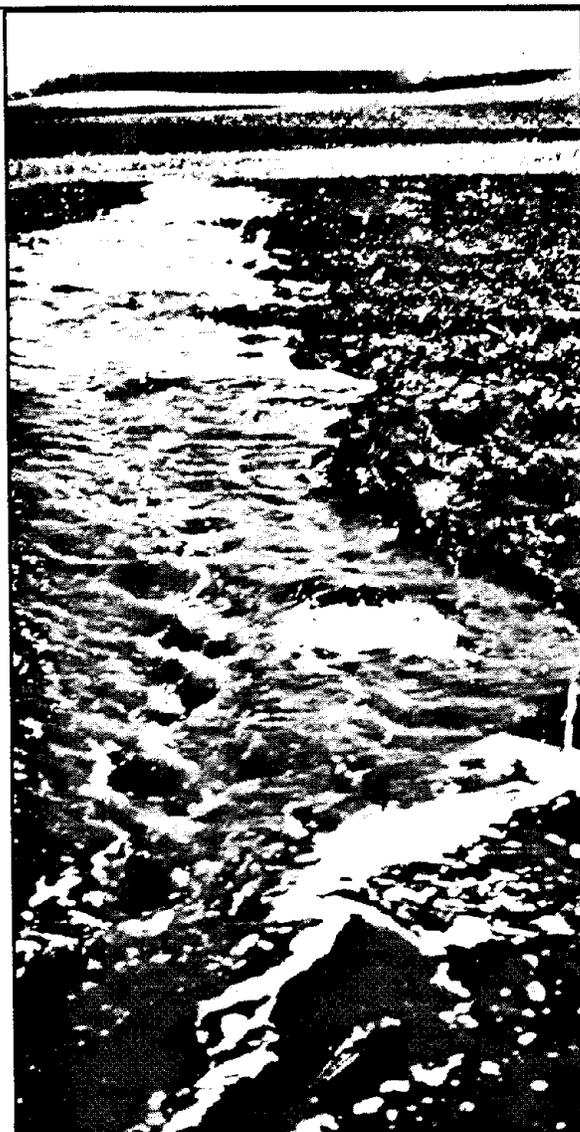
Summit County is conducting the project; it consists of using the existing Swan Mountain Road embankment and installing a new outlet structure to create a flow-through detention pond (wet pond) in the Soda Creek channel to intercept all flows before they enter the reservoir. The wet pond is expected to remove 25 to 50 percent of the total phosphorus load that would otherwise enter the reservoir from Soda Creek.

The anticipated benefit from the project is the removal of 35 to 40 pounds/year of phosphorus from Dillon Reservoir. For reference, it is important to note that if 40 pounds/year are removed from Soda Creek, that will be more than twice the amount discharged by the Snake River wastewater treatment plant during all of 1987.

- **Soil Conservation Service:** SCS used P.L. 83-566 watershed program funds for the following sediment reduction projects:
 - Red Wash, a White River tributary,
 - Trinidad Lake watershed, and
 - Highland Breaks/Limestone-Graveyard Creeks, located in the lower Arkansas River basin.
- **Soil Conservation Service/Bureau of Reclamation Colorado River Salinity Projects:** In Colorado, activities are currently underway in the Grand Valley Unit, the Lower Gunnison Unit, and McElmo Creek Unit.
- **Agriculture Stabilization and Conservation Service-ACP Special Water Quality Projects:** An ACP special water quality project is underway on a tributary to the Arkansas River. It is intended to curb streambank erosion and reduce sedimentation in Currant Creek and the Arkansas River.
- **Bureau of Land Management Riparian Demonstration Projects:** BLM is implementing a riparian policy intended to improve the condition of riparian zones on BLM land in Colorado. Nine demonstration projects covering all four districts in Colorado are intended to determine the best means of restoring and maintaining these valuable resources.

- **U.S. Forest Service Trout Creek Project, Chaffee County:** This project is improving 22 acres of eroding banks that will rehabilitate approximately one mile of stream. The project will include log structures and willow and grass plantings.
- **The Colorado Mine Land Reclamation Division** has worked at three abandoned mine sites in the past year to both abate hazards and improve water quality.
- **Town of Alice/Silver Creek:** Lime was added to a filled and capped glory hole to raise the pH of water percolating through the fill, which was composed of old mine tailings and waste rock. This project has substantially raised the pH of water in nearby Little Creek.
- **Thompson No. 2 Mine:** The Mine Land Reclamation Division renovated a poorly functioning passive mine drainage system at this coal mine in Pitkin County.
- **Purgatoire Projects:** Over the past three years, the Mine Land Reclamation Division has completed several erosion and sediment control projects along the Purgatoire River to reduce the amount of coal waste bank material deposited in Trinidad Lake. Projects included streambank/arroyo stabilization and waste pile reclamation at the old Sopris Coal Mine, arroyo stabilization and waste pile reclamation at the Frederick Mine, and streambank erosion control at waste piles near Tijeros.
- **Colorado Division of Wildlife—Fishing is Fun:** The Colorado Division of Wildlife sponsors the Fishing is Fun Program, which provides money for habitat improvements. The program is funded by federal money collected through the sale of fishing equipment. Local governments and interested groups may apply for these funds, but a match is required. Since the program began in 1987, \$1,171,000 in improvements have been made.

Colorado has made significant progress in achieving milestones in three areas: agriculture/silviculture, urban and construction, and mining. Most notably, demonstration projects are underway or completed in both the mining and the urban/construction programs. In addition, the Cherry Creek Basin Authority developed an educational video about phosphorus loadings.



Water rushes through a field following a rain storm, resulting in soil erosion, and pesticide and nutrient runoff.

The nonpoint source subcommittee has been coordinating efforts with the Colorado State Storm Water Task Force. The urban and construction BMPs developed by the subcommittee are being used by the task force, with completion of a storm water BMP manual scheduled for 1990. Two municipalities and a county are using the model erosion, grading, and sedimentation ordinance developed for the nonpoint source management program as a guide in writing their own ordinances.

Further Actions Needed/Recommendations

Colorado is encouraged by the efforts this past year to re-establish a permanent nonpoint source control

program in the state. Three areas that require a long-term commitment to ensure successful program implementation are research, education, and demonstration.

Research that focuses on BMP effectiveness is very important, particularly in the areas of urban runoff and abandoned mine drainage. This is particularly true for urban runoff in light of the storm water discharge requirements forthcoming from EPA. Research into means of treating abandoned mine drainages is also critical for Colorado's nonpoint source program.

BMPs must be demonstrated to promote their use as pollution-abating techniques. A commitment to funding demonstration projects through section 319 is essential to the success of the program.

Finally, an educational program that focuses not only on remediation of existing problems but also emphasizes prevention of nonpoint sources is critical. Such a program deserves national and state attention in primary and secondary education.

Federal Consistency

Colorado's approved management program contains a list of federal programs and activities that are subject to the Federal Consistency Review. A major program activity that Colorado intends to pursue in the coming year is Memoranda of Understanding with a number of federal agencies. The MOUs will provide a basis for review of important nonpoint source issues. In particular, the use of BMPs and other management techniques by federal land management agencies (BLM, Forest Service) will be a focus of these MOUs.

Several important nonpoint source federal consistency reviews performed by the Water Quality Control Division in FY 1989 included the revision to the U.S. Fish and Wildlife Service Region 2 *Regional Guide*, the amendment to the Grand Mesa, Uncompahgre, and Gunnison National Forest Land and Resource Management Plan, and the environmental impact statement scoping for cumulative impacts of oil and gas development on BLM lands in Colorado. To date, no irresolvable problems have arisen from these reviews.

Funding Summary

The Water Quality Control Division received a \$141,307 grant under section 205(j)(5) to manage and operate the state nonpoint source program, and a second grant under section 201(g)(1)(B) to support eight demonstration and education projects in accordance with the Colorado nonpoint source management program. A total of \$199,307 was used for

statewide activities, while \$443,046 was spent on watershed projects.

MONTANA

Montana's nonpoint source management program emphasizes education, technical assistance, and financial incentives for landowners and managers to voluntarily implement BMPs that will prevent or mitigate water quality problems. Enforcement authority is exerted where sufficient evidence of nonpoint source pollution exists.

The Water Quality Bureau of the Montana Department of Health and Environmental Sciences is the lead agency for the management program, and a Nonpoint Source Task Force oversees implementation. The program stresses a strong, pro-active educational component to minimize nonpoint source problems.

Statewide Activities

- **Riparian Management Education:** The Montana Riparian Education Committee developed educational materials on riparian management and convened approximately 20 workshops and tours throughout Montana during the past year.
- **Ground-water Protection Education Program:** Montana's Cooperative Extension Service launched a three-year statewide educational program concerning ground water. Extension also is cooperating with EPA to test the water quality of a number of wells in the state.
- **Saline Tour:** The Montana Salinity Control Association sponsored a tour to saline seeps and identified problems associated with seep and constraints in controlling it.
- **Educational Material for Children:** The Water Quality Bureau used section 205(j) and 604(b) pass-through funding to provide a grant to the Missoula County Conservation district to develop a water quality education program for junior high school students.
- **Demonstration Projects:** Current demonstration projects address agriculture and silviculture, but others will be planned for each major category of nonpoint source pollution in Montana.

- **Coordination of Monitoring and Assessment Activities:** The Bureau mailed a survey to Nonpoint Source Task Force members and other interested individuals regarding monitoring and assessment needs and opportunities. The results were compiled and reviewed by the task force in February.
- **Forestry Information Bill:** The 1989 legislature passed a bill that requires private landowners to notify the Forestry Division of the Department of State Lands before they sell timber. The department must provide information on appropriate BMPs and review proposed timber sales in important watersheds.

Watershed Activities

- **Flathead River Study:** This study examines the effects of past and current logging on water quality to ascertain if selected BMPs are meeting water quality objectives.
- **Abandoned Mines Program:** The Bureau has reviewed the list of streams affected by mining and addressed by the Abandoned Mine Lands Program. The program was expected to have completed reclaimed coal projects in 1989. Beginning in 1990 and continuing through 1995, approximately \$5 million will be available per year to reclaim hardrock mining sites. Mining BMPs are being reviewed by state agencies.
- **Otter Creek:** This project is intended to reverse the impairment of fisheries resulting from mass wasting banks, irrigation return flows, and channel changes. A monitoring strategy was developed and a fisheries evaluation and census completed. SCS will perform vegetative surveys before and after project implementation; sediment sampling has already begun.
- **Godfrey Creek:** This project involves providing technical and financial assistance, particularly to dairy farmers, to help deal with pollution problems in the creek caused by agricultural activities.
- **East Spring Creek:** Implementation began in 1987 to combat excessive sedimentation and irrigation withdrawals that have created barriers to spawning trout and salmon. The project will be completed when additional funding is secured.



A severely eroding logging road.

While there has been no measurable reduction in pollutant loadings to date, more people and agencies in Montana than ever before are working together to solve nonpoint source problems.

Funding Summary

During state Fiscal Year 1989, Montana used approximately \$112,000 of 205 (j) funds for water quality monitoring and supporting three positions.

NORTH DAKOTA

Nonpoint source pollution is the primary cause of water quality degradation in North Dakota's lakes and rivers. Agriculture is North Dakota's major industry and the major contributor to nonpoint source pollution; therefore, both statewide and watershed nonpoint source activities focus primarily on agriculture.

Statewide Activities

Educational programs are being developed at the state and county levels in addition to the educational components stressed in watershed projects.

This extremely important facet of nonpoint source pollution abatement involves both North Dakota's adults and youth.

The state has contracted with the North Dakota State University Cooperative Extension Service to develop a water quality education program that will tell the public about agricultural nonpoint source pollution and its effects on surface water and ground water. The program, to be coordinated with the Water Education for Teachers (WET) program administered by the North Dakota State Water Commission, will emphasize management and cultural activities to lessen nonpoint source impacts. Six statewide news releases dealing with nonpoint source pollution (four for television and two for radio) will be developed and presented. Nitrogen and pesticide management guides and videos on ways to minimize ground-water contamination also will be developed.

The North Dakota State Department of Health and Consolidated Laboratories, in cooperation with the North Dakota Department of Agriculture and EPA, produced the state agricultural chemicals and ground-water strategy, which is an overview of national and state activities. The strategy also reviews the status of agricultural chemical studies in North Dakota. Initially, the document will be used to educate state agencies and legislators.

Watershed Activities

Five 205 (j) projects were conducted during FY 1989. Four watershed projects involving local soil conservation districts in Stark, Pembina, Grant, and Ransom Counties used a technician to promote agricultural BMPs. These projects are summarized here.

- **Patterson Lake:** During the past fiscal year, 82 meetings were held with farmers and the following BMPs were either in progress or completed:

- a saline seep management plan,
- 3 wildlife shelter belts,
- 10 windbreak shelter belts,
- 6 grazing management areas,
- 5 grassed waterways,
- 2 animal waste systems,
- 2 diking systems, and
- 16 grass seeding plans.

Two feedlot operations also were relocated to lessen water quality impacts.

- **Renwick Dam - Tongue River Watershed:**

The Conservation Reserve Program (CRP) was the starting point for this project in Pembina and Cavalier counties. Of the 45 farmers contacted regarding CRP enrollment, six placed 1,026 acres of filter strips under the CRP. Tree planting within the watershed included 37,258 feet of field windbreaks and 12,620 feet of farm shelter belts. An inventory of critically eroding areas has begun and three runoff events have been sampled to provide background water quality data for the project.

An accelerated land treatment plan for the Tongue River watershed was developed by the SCS, resource conservation groups, and the district soil conservation office. Outreach activities on chemical management and the disposal of empty containers are in the planning stage.

- **Raleigh Dam Watershed Project:**

The technician met with seven producers to discuss conservation planning and seeding assistance in the immediate watershed area and tree planting in picnic areas along the dam. Determination of crop and range land areas and acreages were completed with soil classes, grass waterways, tree plantings, and needed conservation practices identified.

- **Cheyenne River Improvement Project:**

The technician made at least 290 farm contacts, providing technical assistance on grass seeding and encouraging producers to plant windbreaks and wildlife food plots, restore wetlands, and enroll in the CRP. To date, 20,644 acres have been entered into the CRP, mostly for grass seeding or tree planting. Conservation compliance plans having been written for 19 farmers on 1,474 acres of highly erodible field.

Other nonpoint source watershed activities included two applications for ASCS-ACP Special Water Quality Projects, a wetland restoration project through the State Waterbank Program, Barnes County Abandoned Well Project, Barnes County Ecology Education Camp, and water quality monitoring of a saline lake to determine the feasibility of a lake freshening project.

Water Quality Improvements

Limited water quality data exist for nonpoint source project areas, and no trend analysis has been completed at this time.

Recommendations for Future Programs

Compatibility between agricultural conservation programs and commodity price support programs needs to be developed. Many producers are engaged in farming activities mandated by farm legislation but which adversely affect conservation and water quality. For example, planting monoculture crops and maintaining weed-free fields (excessive fallowing) actually increase erosion, thereby degrading water quality.

Federal Consistency

The nonpoint source task force and North Dakota's Department of Health and Consolidated Labs have worked with a number of federal agencies such as SCS, U.S. Fish and Wildlife Service, and USGS and now are working with ASCS on two ACP-Special Water Quality Projects.

Funding Summary

The state used \$60,000 (no state match) under section 205(j)(5) to develop the section 319 assessment and management program.

SOUTH DAKOTA

The South Dakota Department of Water and Natural Resources (DWRN) manages the state's nonpoint source water pollution control program and carries out the provisions of the Clean Water Act. The state nonpoint source management program focuses on controlling impacts from agricultural fertilizers, pesticides, and sediment, building upon the experience gained from the Lake Herman Model Implementation Program project and the Oakwood Lakes - Poinsett Rural Clean Water Program project. Priority waterbodies consist primarily of lakes and aquifers.

Highlights of the year include:

- reorganization of DWRN to create a four-person nonpoint source program supported by a four-person Clean Lakes staff;

- establishment of a broad-based Nonpoint Source Task Force to initiate and coordinate activities, develop nonpoint source policy, exchange information, and make funding decisions; and
- funding of both development and implementation nonpoint source pollution control projects.

Much of the program planning has been completed and the approved, four-year management program lays out the South Dakota strategy for dealing with its complex mix of nonpoint source pollution problems.

Statewide Activities

- **Nonpoint Source Task Force:** South Dakota established a Nonpoint Source Task Force to:
 - provide a forum for the exchange of information on activities that affect nonpoint source pollution control;
 - rank waterbodies for nonpoint source control activities;
 - review and approve proposals for funding under sections 205 (j), 201 (g)(1)(B) and 319 of the Clean Water Act;
 - review federal, state, and local governmental programs to assure that the programs control nonpoint source pollution in the most efficient manner;
 - serve as a focal point for information, education, and public awareness regarding nonpoint source pollution control;
 - provide oversight of nonpoint source control activities (including those on federal lands) and rank the activities; and
 - provide a forum for discussion and resolution of program conflicts.

DWRN retains ultimate responsibility for these functions but, to the extent that it can, has delegated these responsibilities to the Task Force because of the difficulty in pursuing this complex program without an interagency program consensus. Because of the high level of interest and activity in nonpoint source pollution control, the Task Force meets monthly.

The Task Force has established seven priority nonpoint source categories: agriculture, silviculture,

construction, urban runoff, resource extraction, land disposal, and hydrologic/habitat modification.

The state has targeted certain waterbodies for intensive efforts to control nonpoint source pollution. Under this approach, all waterbodies in the state were listed as priorities for action; the Task Force then selected those at the top of the list for rigorous nonpoint source control programs. Streams, lakes, and aquifers were ranked separately and the highest priority waterbodies were selected from each list. The basis for aquifer prioritization was water quality protection and pollution prevention.

DWNR and the Task Force will use the priority waterbody list in project development, selection, and funding, but other factors such as public support, availability of match funds, and federal program priorities also will come into play.

■ **Information and Education:** The Task Force directed DWNR to earmark \$200,000 of section 201 (g)(1)(B) funds over four years to support a statewide nonpoint source information and education (I&E) program. The South Dakota Department of Agriculture has provided a person to act as the I&E Coordinator. The objectives of this program are to:

- create awareness of nonpoint source pollution problems in the state;
- educate legislators and others about the scope, magnitude, and importance of controlling nonpoint source pollution;
- transfer information gained at nonpoint source projects to the general public and to specific groups that plan to conduct nonpoint source control activities; and
- gather information about nonpoint source activities outside the state to bring to the Task Force and other decisionmakers.

■ **Focus on Ground Water:** Ground-water pollution by agricultural chemicals is a major state concern. The Oakwood Lakes – Poinsett RCWP project is being used to determine the impacts of agricultural practices on ground water. (See discussion under Region VIII Highlight.) The state also has begun to assess the presence of pesticides and nitrates in specific areas. Ground-water sampling of selected public water supplies for pesticide analysis has been performed in two studies since 1985.

■ **Legislation:** Several factors (including agricultural and mining impacts on ground water and several toxic spills) prompted the 1989

South Dakota Legislature to pass the Centennial Environmental Protection Act, which the governor signed into law on March 15, 1989. Section 29 of the law formally recognizes the South Dakota Ground-water Protection Strategy and requires that all state ground-water activities be coordinated to ensure that comprehensive ground-water protection and management are achieved efficiently. Specifically, this bill requires public education and technology transfer, guidance for a wellhead protection program to safeguard the public water supply, water quality analysis for all new domestic wells, certification of individuals responsible for installation, construction, repair, and alteration of individual and on-site wastewater disposal systems, and the regulation of bulk storage chemicals relating to potential contamination of public water supplies.

The bill also calls for continuous evaluation and modification of nonpoint source BMPs for fertilizers and pesticides and additional information on the cumulative impacts of mining.

In addition, the bill establishes a fund for developing and implementing ground-water management and protection. This fund is generated over five years by fees placed on various potential contaminants, including:

- \$25 annual registration fee for each pesticide registered in the state,
- 10 cents per ton per year for all commercial fertilizer distributed in the state,
- \$100,000 annually from the petroleum release compensation fund, and
- 2 cents per pound per year of cyanide or other leaching agent used in surface mining operations.

Watershed Activities

■ **Big Stone Lake:** Big Stone Lake is a shallow body of water with a 729,000-acre watershed. Land use in the watershed is approximately 76 percent cropland, 19 percent pasture and range, and 5 percent other uses. Since 1984, BMPs have been used to control agricultural runoff in the watershed. Using Community Development Block Grants, Clean Lakes Program funding, and the CRP, cooperators have installed 16 animal waste management systems, retired 12,675 acres of cropland, and implemented other needed BMPs. Project leaders have also secured approximately

\$600,000 in section 201(g)(1)(B) funds, ACP funds, and other funds for additional waste management systems and BMPs through 1990.

- **Wall Lake:** Wall Lake is a shallow, 215-acre glacial lake that drains 3,680 acres, primarily agricultural land. About 400 acres of cropland need BMPs to address water quality problems, which include fish kills and hypereutrophication. Section 201(g)(1)(B) grant funds will provide for sediment removal, wetland restoration, feedlot management, and water quality monitoring.

Dredging is expected to remove approximately 950,000 cubic yards of in-lake sediment. The two five-acre wetlands proposed for restoration receive runoff from the watershed before discharging to Wall Lake. Restoration plans call for removal of enriched sediment, construction of low-head weirs to retard runoff, construction of emergency spillways, construction of berms, restoration of outlet channels, riprapping, and revegetation with native wetland species. Animal waste management systems will be installed where needed to control nutrient input to the lake.

- **Lake Herman:** Lake Herman is a 43,000-acre glacial lake with a well-known history of water quality problems such as fishkills and algal blooms. Three sediment control structures and other BMPs installed under the Model Implementation and Clean Lakes programs controlled erosion on approximately 87 percent of the watershed. Shoreline stabilization protected eroding banks around the lake. However, those measures did not improve the lake's water quality sufficiently. This prompted the decision to dredge Herman Slough, a source of sediments and nutrients to Lake Herman. Section 201(g)(1)(b) funds have been secured for this purpose.

A water quality monitoring program was established to quantify effects of dredging operations and spoil on Lake Herman, the Herman Slough, and the local ground water. Data are being collected from three in-lake sites, two sites in the slough, the return flows from the disposal ponds, and seven monitoring wells both above and below the dredge spoil containment structures.

- **Silviculture:** Grace Coolidge Creek and a stretch of Rapid Creek have been adversely affected by runoff laden with silt, ash, and sediment. Wildfire burned portions of these

watersheds and destroyed much of the vegetation that normally would stabilize soils and minimize erosion.

During FY 1989, projects were started in both watersheds. SCS and the South Dakota Department of Game, Fish, and Parks implemented a restoration project using SCS Emergency Watershed Program funds. Approximately 5,500 acres of "blowout" areas were treated with 18.5 miles of terraces, reseeding, and 270 small sediment traps. A few ponds along the creek also were cleaned out to restore storage capacity (and indirectly benefit the trout fishery).

Water Quality Improvements

Because section 319 implementation projects have just begun, water quality improvements have not been documented for Big Stone Lake, Lake Herman, or Wall Lake. Monitoring programs for these projects will provide data to document future improvements.

Funding Summary

Eight nonpoint source development projects were under contract in FY 1989, with five more approved but not funded. Section 205(g)(1)(B) implementation funds were obligated to three watershed projects (Big Stone Lake, Lake Herman, and Wall Lake) and one statewide information and education program.

Approximately \$78,400 in nonpoint source program development funding was matched with \$3,200 in local funds to provide about \$82,000 of total program development funds in FY 1989. Approximately \$1.1 million in nonpoint source program implementation funds was provided (\$660,000 federal/\$440,000 state/local) in FY 1989.

UTAH

Utah's nonpoint source program is intended to provide a baseline of nonpoint source pollution control across the state. Statewide programs are designed to achieve BMP implementation by raising public awareness, coordinating government activities, and educating landowners and managers regarding BMPs.

The cornerstone for the state effort is the Utah Nonpoint Source Task Force. The lead agency for administering section 319 grants, coordinating statewide activities, and monitoring is the Bureau of Water Pollution Control, Utah Department of Health (BWPC). The Utah Department of Agriculture (UDA) implements demonstration projects and the education program.

Utah's nonpoint source pollution problems consist primarily of sediment, nutrients, and salinity. Approximately 70 percent of the state's nonpoint source impairments are attributable to agricultural activities.

Statewide Activities

Statewide activities to control nonpoint source pollution include local zoning and building regulations aimed at reducing urban runoff, incentive programs that promote the voluntary adoption of soil conservation practices, education about correct use of pesticides, and a wide variety of related programs. While the primary goal of a few programs is to improve water quality, most focus on controlling erosion or conserving water and only secondarily on improving water quality.

Through its nonpoint source management program, the state is trying to consolidate diverse resources and develop a coordinated approach to controlling this pollution. Central to this approach is a strategy that not only addresses nonpoint source problems but also coordinates and complements the activities of other agencies.

To maximize and focus nonpoint pollution control efforts, the BWDC and UDA compiled a list of priority watersheds. As BMPs are implemented and problem areas are controlled, the priority list will be updated and reviewed by the Nonpoint Source Technical Advisory Committee.

Other agencies also are taking lead roles in statewide activities. One agency, the Bureau of Land Management-Utah (BLM-Utah), has started to plan and build structures for implementing nonpoint source controls under section 319. BLM-Utah also held a training session for all phases of riparian management. The session resulted in the development of riparian management plans for each of the five BLM-Utah districts. In addition, each soil and water conservation district is conducting grazing management activities, including demonstrations.

The Utah State University Cooperative Extension Service is involved in several areas related to nonpoint source pollution control, including pesticide safety training, integrated pest management, irrigation water management, fertilizer management, conservation tillage, and low-input agriculture.

The Forest Service, which manages water quality on National Forest System lands, is responsible for BMP implementation and compliance with state water quality standards. The agency and the Utah Department of Health are negotiating a memorandum of understanding to coordinate water pollution control activities on National Forest Service lands.

Watershed Activities

- **Echo Creek Watershed:** A tributary of the Weber River that supplies water to over 500,000 people and also is a coldwater fishery, Echo Creek is the only uncontrolled stream in the Weber basin. Sediment is impairing the Weber River fishery and water supply — and up to 70 percent of the sediment entering the Weber River is from Echo Creek. The creek water quality has been affected by poor rangeland and weed control, erosion, and extensive hydrologic modification from road and railroad construction.

Under USDA's ACP-Special Water Quality Program, \$140,000 in cost-share funds has been made available to landowners to protect the stream and grazing land and to improve the vegetative range. The Utah Department of Transportation has helped target areas in the watershed needing assistance for both safety and sediment control. In addition, progress has been made with Union Pacific Railroad to identify areas where cooperative efforts can stabilize streambanks affected by the railroad.

The Weber Basin Conservancy and local rock quarries contributed to a demonstration project that showed ways to enhance or restore streambank stability. Low-drop log checks, riprap, and juniper tree plantings were the BMPs promoted in this effort.

- **Little Bear River Watershed Project:** Sediment is affecting two reservoirs formed by the impoundment of the Little Bear River. Heavy sedimentation results from thunderstorms, steep slopes, dry land cropping areas, poor channel maintenance, and unstable stream banks. In addition, the Hyrum Reservoir is impaired by nutrients from animal waste and organic runoff. The Bear River soon may be reclassified as a drinking water source, requiring that more stringent water quality standards be met.

To address both the existing water quality problems in the Little Bear River Watershed and the impending water quality needs of the Bear River, the Little Bear River Watershed Management Project was started. Planning has already begun, and limited funding has been secured from state and local sources. In addition, a demonstration project is underway to show landowners ways to reduce stream channel degradation and streambank erosion.

- **Deer Creek Reservoir:** Monitoring of the successful Snake Creek RCWP project contin-

ued in FY 1989. Implementation of animal waste control measures has kept approximately 1,000 kg per year of phosphorus from entering the Deer Creek reservoir. The Deer Creek Reservoir Clean Lakes program has continued the effort initiated under the RCWP project, with additional BMPs constructed at dairies doubling the phosphorus loading reduction.

- **Salt Lake County:** The Salt Lake City-County Health Department coordinates planning along the Jordan River, ensuring that wetlands are maintained to control nonpoint source discharges. An active program to stimulate awareness of nonpoint source problems has increased public understanding of and involvement in nonpoint source control activities.
- **Southeastern Utah:** The Southeastern Utah Association of Local Governments' water quality program strongly emphasizes implementation programs in the **Scofield Reservoir watershed**. Nonpoint source control measures are being implemented under the Clean Lakes Program to complement the extensive sewer construction project administered by the association. The control measures include construction of juniper berms on eroding streambanks, installation of check dams to raise the water table, riparian fencing to reestablish vegetation, and better livestock management.

Other nonpoint projects in this area include the **Abandoned Mine Reclamation project** to remove the Price River coal pile. In 1987, 95,000 tons of coal were removed from the pile and transported to Plateau Mine for storage. Another 250,000 tons are to be removed, compacted, and stored in an abandoned portal site. There may be a third phase if the streambanks are found to be composed of coal. Removal of this coal and reclamation and revegetation of the streambanks will greatly enhance water quality in the Price River, which has been adversely affected by the constant erosion of this pile.

Another effort is the recently completed improvement in the **North Hughes watershed** near the Manti-LaSal National Forest. The affected area includes 150 acres in the North Hughes drainage and 50 acres in the Mud Creek drainage, which is a tributary to Scofield Reservoir. The Forest Service estimates that the contour trenching and revegetation will reduce nonpoint sediment loading

to Huntington Creek by 40 percent from North Hughes Canyon and by 15 percent from Mud Creek.

- **Salinity Control:** Salinity problems have been identified and evaluated in the following resource areas: Gand, San Juan, Price, San Rafael, Kanab, and Henry Mountain. Activity plans have been written for Sagers Wash, Round Valley, Pariette Draw, Castle Peak, and Red Creek, and projects are being implemented in Sagers Wash, Castle Peak, and Red Creek. Sagers Wash was identified as the principal source of strongly saline soils on public lands administered by the Bureau of Land Management and is Utah's nomination to BLM for designation as a Comprehensive Watershed Management Planning and Water Erosion Protection Project.

River basin studies are in progress in the Virgin River drainage and Montezuma Creek. Watershed planning is in place in the Muddy Creek-Orderville and Rabbit Gulch watersheds. SCS is continuing the salinity control program in the Utah Basin and salinity control efforts are in the planning stage for the Price-San Rafael drainage.

These projects focus on the reduction of salt loading by controlling erosion. Typical BMPs include grazing management, seeding, structures, contour furrowing, and fencing.

Water Quality Improvements

Water quality data are insufficient to report improvement in nonpoint source program areas. As implementation efforts are realized and water quality trends are established through monitoring, water quality can be evaluated for improvement.

WYOMING

The Planning and Nonpoint Source Pollution Control Section of the Wyoming Department of Environmental Quality's Water Quality Division is responsible for meeting the requirements of section 319 of the Clean Water Act. The staff of this section also performs a wide variety of water quality planning, coordination, and technical support to meet other federal and state requirements. During FY 1989, Wyoming focused primarily on developing an approvable nonpoint source management program using 205(j)(5) funding.

Statewide Activities

Numerous presentations were given to various groups and articles were written for newsletters in an attempt to educate the public about the purpose of the nonpoint source management program. It is obvious from public comments that additional educational efforts must be undertaken. However, major gains are being seen in achieving coordination and cooperation among the numerous state, federal, and local agencies involved in combatting nonpoint source pollution.

In addition to producing a nonpoint source management program, Wyoming updated its Water Quality Management Plan Continuing Planning Process (CPP). The CPP has been adopted by the Water Quality Advisory Board and is undergoing final modifications before it is submitted to the Governor for certification. The CPP includes public participation, the total maximum daily load procedure, wasteload allocations, planning, and overall water quality goals for the state.

Because hydromodification could significantly affect Wyoming's water quality, wetlands initiatives received increased staff attention through participation in a state wetlands policy task force and the section 401 certification process.

Land use and ownership patterns in the state make implementation of the section 319 program difficult. Half of the land in Wyoming is owned by the federal government. Because funds from other federal programs cannot be used as the local match for nonpoint source pollution control projects, an independent source must provide the match for projects on federally owned and managed lands.

Compounding these difficulties is the fact that many of the federal lands are used for agricultural and range land. While nonpoint source programs could provide tremendous benefits to such lands, many ranchers and farmers do not have the funds needed to cost share BMPs.

Watershed Activities

■ **Flaming Gorge:** In 1983, a study team was established to identify the sources of phosphorus contributing to eutrophication problems in Flaming Gorge Reservoir. Analysis of internal versus external loading, estimation of point source and nonpoint source contributions, and development of a phosphorus budget began in FY 1989. This multi-agency interstate project has been funded primarily by the Bureau of Reclamation and the state.

■ **Ocean Lake:** This lake, an important black crappie fishery until the mid-1960s, is severely impaired by sediment loads from irriga-

tion return flows. Two irrigation drains were found to be producing 78 percent of the total sediment load to the lake. In 1988, the Water Quality Division contracted with the Riverton Conservation District to perform a BMP demonstration project. Using \$16,926 in section 205(j)(1) pass-through funds, the district built drop structures, fenced out livestock, and installed inlets, pipes, water gaps, and diversion dikes. While before and after photos suggest dramatic changes, data are not yet available to quantitatively evaluate water quality improvements. This project was initially negotiated as a multi-year project, and further funding probably will be provided under either sections 319 or 205(j)(1).

■ **Sloan's Lake:** Sloan's Lake in Cheyenne is a shallow municipal lake in which excessive macrophyte growth has impaired recreational use. Using 205(j)(1) funds, the city of Cheyenne is characterizing the distribution of sediments and macrophytes, estimating watershed/storm sewer and ground-water nutrient contributions, identifying and mapping land uses in the drainage area, and developing a nutrient budget for the lake. The next phase will identify appropriate lake management practices to improve the lake's water quality.

■ **Muddy Creek:** The Muddy Creek watershed is a major contributor of sediment to the Little Snake River. Local ranchers, the Little Snake River Conservation District, the Department of Environmental Quality, SCS, BLM, and the University of Wyoming are evaluating background erosion rates and assessing the effectiveness of BMPs. The conservation district will take the lead in developing an overall watershed management plan for the drainage area.

■ **Silvertip Watershed Study:** The forest fires of 1988 burned many drainages in the Shoshone National Forest. Little background water quality data were available on which to base water quality impact analyses or reclamation success, so a paired watershed study was established to track water quality improvement. The key difference between the two watersheds is that one was untouched by fire, while the other was completely burned.

USGS monitoring stations on the two drainages cost approximately \$79,000 per year. The Water Quality Division contributed \$23,000 of 205(j)(5) funds in FY 1989 to assess the impacts and the success of reclamation.

This project has potentially far-reaching value for forest fire reclamation efforts throughout the country, but long-term monitoring (at least five years) is necessary to document reclamation success. At least \$10,000 per year (\$500,000 total) is needed to complete the monitoring effort.

Federal Consistency Review

Approximately 100 Scoping Statements, Environmental Assessments, Environmental Impact Statements, and Resource Management Plans were evaluated in FY 1989 for nonpoint source impacts. While it is impossible to quantify the benefits that have resulted from this up front review, improved evaluations of water quality impacts, better response to state concerns, and improved coordination between the agencies are evident.

Coordination between the Water Quality Division and federal agencies apparently is improving as a result of increased involvement in the nonpoint source management program. As implementation proceeds, even greater gains are likely to result.



REGION IX

State assessment reports and management programs for each of Region IX's states (Arizona, California, Hawaii, and Nevada) and three of the Island Territories were approved by August 4, 1989. Approvals for Arizona, Hawaii, and Nevada were contingent upon completion of the public participation requirements. These activities have been concluded and final approvals were granted January 4, 1990.

The Pacific Trust Territories did not submit management programs. However, in October 1986 the Marshall Islands and the Federation of Micronesia signed compacts of Free Association that reduced federal involvement and EPA authority in their affairs. The Free Association process and subsequent federal devolution was completed in 1988 leaving only the island of Palou remaining as a U.S. Territory — now known as the Republic of Palou. Palou will be developing a management program this year.

The state programs contain a variety of approaches for managing nonpoint source pollution. While most build upon existing approaches and authorities, Arizona has begun to develop a new regulatory program that emphasizes protecting ground water and wetlands from nonpoint source pollution.

Probably the most difficult aspect of program development has been deciding how to select specific watersheds for treatment and funding. The difficulty results from the lack of good documentation of waterbody problems — a scarcity noted throughout the state assessment reports. In all cases, final decisions on priorities were based on a variety of criteria, including the level of public commitment, the existence of watershed plans, and the complexity of the problem.

Specific assistance by the Region to the states included the following:

- Providing section 205(j)(5) funds to all states and three territories to develop assessment reports and management programs.
- Establishing specific outputs and milestones for all state work plans to ensure timely completion of the reports and programs.
- Conducting quarterly management meetings in all states to determine the progress of program development.
- Assisting and analyzing funding options for expanded uses of construction grants and state revolving fund monies for nonpoint source programs.



● Regional Office

- Funding a GIS/AGNPS source model development on the Verde River in Arizona. The funding for this activity, which will refine the AGNPS source model for use in identifying specific grazing impacts on riparian areas, comes from EPA's Environmental Systems Monitoring Laboratory. This will help the state target nonpoint source treatment in the areas where success is most likely.
- Helping develop the Truckee River Strategy in Nevada by preparing a model for implementing activities to reduce nutrient and temperature loadings in the Truckee watershed.
- Funding Arizona's effort to identify and map wetland areas.
- Co-hosting a two-day workshop with the National Association of Conservation Districts to share information among the states, conservation districts, SCS, and the Forest Service.
- Developing a cross-program strategy to enable states to utilize the many often overlapping federal programs that fund nonpoint source programs.

The states in Region IX contain a large acreage of lands administered by the federal land management agencies (Forest Service and Bureau of Land Management for grazing, mining, and silviculture, and the Department of Defense for grazing and storm water runoff). Large areas also are affected by federal programs and activities that have adverse impacts on water quality.

For these reasons, final federal guidance that supersedes individual agency guidance is crucial to the success of nonpoint source programs. Such guidance not only provides states with needed assistance for their programs but also reminds federal agencies of their responsibilities.

Region IX recommends that the A-106 review process be used to ensure that federal funding is targeted to the agencies and programs responsible for generating the nonpoint source pollution that ultimately affects state lands. Without the A-106 process, there will be little change in the level of federal resources devoted to nonpoint source implementation.

The Region also believes that the grass-roots level exchange of technical information needs to be expanded. One way to do this would be to establish an electronic bulletin board that will allow direct access to information from around the country as well as enhance communication between the states — and eventually anyone with a personal computer and a modem. Installation of such a system at the state level, with the use of available commercial software, will facilitate the exchange of critical information among all levels of federal, state, and local governments and other entities.

ARIZONA

Arizona's nonpoint source management program emphasizes public participation, interagency coordination, and regulatory backup. To the maximum extent practicable, existing state, federal, and local programs have been incorporated into the program. The Arizona Department of Environmental Quality (ADEQ) is the lead agency for developing and implementing the program.

Arizona's 1986 Environmental Quality Act has become the basis of the state's section 319 program. The act addresses the surface and ground-water problems resulting from nonpoint source pollution and mandates an Aquifer Protection Permit Program and a Nonpoint Source Water Quality Management Program. Under the act, there are currently rules relating to nonpoint source control, wastewater and wastewater reuse, aquifer protection and enforcement (except for pesticides), and prevention of pesticide contamination.

Any activity that produces a pollutant that can reasonably be expected to reach navigable waters is subject to the ADEQ plan and approval process (unless the activity already is covered adequately by another ADEQ program). Plans must be submitted that describe the processes to be used to protect or enhance water quality.

ADEQ has established various technical advisory groups to help develop programs to address nonpoint source pollution resulting from agriculture, grazing, urban runoff, and resource extraction. Considerable attention has been given to developing the rules necessary for implementation and compliance. The program has progressed as follows:

- **Aquifer Boundaries Certification:** completed July 1989.
- **Aquifer Water Quality Standards:** adopted June 1989.
- **Aquifer Protection Permit Program:** certified December 1989. Hydrologic and habitat modification was identified as the first priority of the program for 1990.
- **General permits for regulated agricultural activities (irrigation and combined animal feedlot operations):** rules developed; certification expected in 1990.
- **Hydrologic/Habitat Modification Program:** development expected in 1991.
- **Nonpoint source planning rules:** approval expected in 1992.
- **Pesticide Contamination Program:** implemented 1989.
- **Memorandum of Understanding with U.S. Forest Service (for possible delegation of silviculture program):** draft completed September 1989.
- **Water quality training for SCS employees.**
- **Forest Service Integrated Resource Management System:** ADEQ's participation in this program helped heighten awareness of water quality issues, resulting in the implementation of more effective BMPs for forests in Arizona.
- **CES/ADEQ Training:** The state's Cooperative Extension Service and ADEQ jointly provided extensive statewide training about regulated agricultural activities and the pesticide contamination prevention program.

ADEQ has identified a large number of streams that are affected by grazing on federal lands. Arizona is concerned over the impact of these programs on nonpoint source problems; issuance of final consistency guidance should be a priority with EPA.

In addition, the state needs help in finding ways to use GIS data. An information-sharing system such as an electronic bulletin board that is accessible to personal computers and uses standard software would greatly facilitate gathering information about existing activities that could enhance Arizona's program.

Funding Summary

Arizona's Department of Environmental Quality has received \$255,130 in FY 1987 and FY 1988 section 205(j)(5) grant funds. These funds have been used to support salaries for ADEQ staff for nonpoint source program development.

CALIFORNIA

Nonpoint sources are a major cause of water pollution in California. More effective management of nonpoint source pollution will require:

- an explicit long-term commitment by the state and regional water quality control boards;
- more effective coordination of existing state and regional board nonpoint source related programs;
- greater use of regional board regulatory authorities coupled with non-regulatory programs;
- stronger links among the local, state, and federal agencies that have authorities that can be used to manage nonpoint source pollution; and
- development of new funding sources.

The state already has substantial authority to manage nonpoint source problems. This authority includes the Porter-Cologne Water Quality Control Act, which establishes a comprehensive water quality control program for both point and nonpoint sources. The principal means of implementing these controls is by issuing waste discharge requirements; these may be applied to both point and nonpoint sources affecting both surface and ground waters, including discharges to land. The State Board and the nine regional boards administer the program.



Rain washes loose dirt from this construction site down a steep city hill into a stream at the bottom.

The state management program contains three general approaches to addressing nonpoint source problems:

- Voluntary implementation of BMPs.
- Regulatory-based encouragement of BMP implementation.
- Issuance of waste discharge or effluent requirements.

While the State Board has an ongoing program to deal with serious nonpoint source water quality problems, the federal program provides new emphasis on the need to direct more effort into abating nonpoint source pollution. In recognition of the need for additional money to support the nonpoint source program, California has reserved \$12 million from Title II discretionary funds and Title VI funds for nonpoint source implementation activities.

Watershed Activities

Some of the specific activities in California's nonpoint source management plan are:

- **Sacramento River:** Efforts to manage herbicides discharged into the Sacramento River are

continuing, resulting in some success. For example, molinate loading has dropped 86 percent since the program started in 1982, and fishkills have virtually ceased. The effort features BMPs targeted to Sacramento Valley rice growers and strict state regulation of the sales and application of rice herbicides.

■ **San Francisco Bay Urban Runoff Management:** The San Francisco Bay Regional Board is working with local jurisdictions to control runoff from urban development into the bay, which is the largest estuary wetland system on the Pacific coast and one of the richest in the country.

■ **San Joaquin Agricultural Runoff Management:** An effort by the Central Valley Regional Quality Control Board to control agricultural nonpoint source discharges to the San Joaquin River system has begun. Surface and subsurface drainage from intensive agriculture results in pollutant loadings from salts, pesticides, and mobilized naturally occurring trace elements such as selenium and boron. Water quality objectives for trace elements have been set.

■ **Newport Bay Watershed Management:** Newport Bay is the largest of Southern California's remaining coastal wetlands. Urban and agricultural runoff is threatening this bay, which is a designated state ecological reserve. The Santa Ana Regional Water Quality Control Board has worked closely with other state and local agencies to implement a management program that includes

- construction of vessel pump-out facilities,
- enactment of ordinances to address marine sanitation in Newport Harbor,
- dredging controls,
- creation of an 85-acre sedimentation basin using joint state, local, and private funding,
- implementation of more effective erosion control ordinances by the three major local jurisdictions in the watershed,
- agricultural erosion controls, and
- channel stabilization.



Rock riprap retains the soil on this slope above a creek.

- **Timber Harvest Controls:** Pursuant to section 208 of the Clean Water Act, the State Board has certified strong and comprehensive water quality management plans for silvicultural activities both on national forest and non-federal lands. The U.S. Forest Service and the State Board of Forestry are managing these plans, each of which includes detailed forest practice standards that have been certified as BMPs by the State Board. Each plan also includes interagency procedures for BMP implementation, coordination, and reporting.

To minimize duplication among the growing number of nonpoint source programs offered at the state and federal levels, California recommends that EPA initiate a systematic information transfer program. The program would be particularly useful if it included an indexing system — preferably using standard software — to help the states identify the programs that address their specific needs.

The state also encourages cross-compliance between USDA and EPA programs to support water quality goals. The soil protection provisions of the 1985 Food Security Act provide a model for such cross-compliance.

The lack of consistency between some federal programs and California programs often poses problems for nonpoint source control. For example, one of the nonpoint source categories established in California's management plan is hydrologic modification, which is an intrinsic element of hydroelectric power generation. The Federal Energy Regulatory Commission, which licenses hydroelectric facilities, contends that it has exclusive jurisdiction to control the diversion and use of water for hydroelectric generation. However, FERC's assertion of exclusive jurisdiction compromises California's ability to adequately protect in-stream beneficial uses from the effects of hydrologic modification. California has initiated litigation to resolve this issue.

Funding Summary

California has received the following grants for nonpoint source control:

- Section 205(j)(5) federal FY 1987 grant: Nonpoint Source Program Development, \$347,415; Forest Activities Program Development, \$474,156.
- Section 201(g)(1)(B) federal FY 1989 grant (water quality management for forest activities): federal grant, \$698,594; state match, \$465,729.
- Resource Conservation and Development and Watershed Protection (P.L. 566) projects;
- technical assistance to farmers and ranchers; and
- participation in the development of county-level conservation plans.

HAWAII

Hawaii mandated nonpoint source management activities in its section 208 (Clean Water Act) Water Quality Management Plan. The Hawaii Department of Health Services (DOH) is the designated state water quality management agency, with responsibility for developing water quality standards as well as monitoring and protecting water quality. As part of those responsibilities, DOH developed the state's nonpoint source management program.

Soil and water conservation district representatives form the nucleus of Hawaii's Technical Committee on Nonpoint Source Pollution Control. The committee also includes representatives from ASCS, SCS, the Forest Service, the State Department of Land and Natural Resources, Department of Hawaiian Home Lands, Department of Agriculture, and the University of Hawaii. The committee's major responsibilities include reviewing the state assessment report and management plan, maintaining and facilitating interagency efforts to implement effective nonpoint source pollution management programs, and setting priorities for nonpoint source implementation projects.

Agriculture and construction runoff generate the largest nonpoint source pollution loadings in Hawaii. Construction runoff is addressed through county grading ordinances that require conservation plans to be submitted prior to grading or removal of vegetation. A permit from the appropriate County Department of Public Works is required for grading, grubbing, or stockpiling earth materials in urban areas; ordinances limit the amount of land that can be bared at any given time. Soil erosion problems (resulting from the almost daily rainfall in Hawaii) are addressed by appropriate BMPs such as minimizing slopes, building sediment retention basins, and constructing drainage facilities. Local nonpoint source pollution is managed by the soil and water conservation districts. In cooperation with SCS, the districts help land management cooperators, the general public, and other agencies reduce soil erosion and protect water quality. Specific activities include the following information and education programs:



Eroding range land that has been overgrazed. Photo by Ann Beier.

In addition, the Hawaii Association of Conservation Districts began developing a Conservation District Water Management Plan in June 1989. The plan will identify county, state, and federal programs designed to protect water quality and recommend ways to maximize their effectiveness. The plan also will identify additional resources needed by state and local agencies to reduce nonpoint source pollution, improve surface and coastal water quality, and prevent degradation of ground-water quality. The Hawaii Association of Conservation Districts will request enabling legislation from the 1991 state legislature.

To promote the USDA Water Quality Initiative, the SCS Hawaii state office has provided a full-time staff person to help the Hawaii Association of Conservation Districts develop this plan. SCS is the main federal provider of technical assistance for the development, application, and maintenance of soil and water conservation best management practices.

Specific activities included in the management plan include:

- establishing a maximum level of heavy metals in near-coastal waters;
- holding an annual nonpoint source pollution control workshop;
- holding public hearings; and
- providing the outreach needed to complete the assessment report and management program.

In addition, DOH is proposing a major research project to determine the magnitude of nonpoint source pollution and to evaluate the effectiveness of BMPs being implemented on the islands of Oahu, Hawaii, Kauai, Maui, and Molokai. This project will include hiring a staff person for each of the islands. The Hawaii Association of Conservation Districts and SCS will provide support for these staff persons.

In 1989, the state legislature reserved \$50,000 from its allotment under Title VI to fund the DOH nonpoint source management program. The legislature also appropriated \$64,755 to support the soil and water conservation district activities.

Although DOH was not successful in securing state funding from the 1989 state legislature, DOH and the Hawaii Association of Conservation Districts will again support requests for funding of the following:

- to secure a permanent staff position to implement a statewide nonpoint source pollution management program;
- to manage feral animals in watersheds;
- to develop BMPs to prevent soil erosion in macadamia nut orchards; and
- to support a cost-sharing program for the development of animal waste management systems suited for tropical environments.

Funding Summary

The state of Hawaii has received its FY 1987 allocation of \$100,000 in section 205(j)(5) funds and was awarded the FY 1988 allocation of \$177,800 in September 1989. These funds have been used for state staff salaries and activities discussed under the milestones.

NEVADA

The primary goal of Nevada's nonpoint source management program is to control and abate the impacts of nonpoint source pollution on the state's surface water and ground water. The Nevada Division of Environmental Protection (NDEP) leads the implementation of the state program.

The management program targets agriculture, silviculture, construction, urban runoff, land disposal, and hydrological and habitat modification for intensive nonpoint source management. To achieve program goals, the state will fully utilize existing programs and develop innovative approaches for local and regional areas (such as Lake Tahoe and the Truckee River Basins). Local and regional management agencies will carry out many of the activities in the management program.

Limited state funding forces reliance on voluntary implementation of BMPs on state and privately owned land; NDEP facilitates cooperation among local, regional, and federal activities. The management program has identified 17 federal programs and agencies that offer financial, technical, regulatory, and/or educational assistance to private landowners, providing the basis for the state's nonpoint source program.

Statewide Activities

Updating the State BMP Handbook: A cooperative effort is underway currently to update this handbook, originally produced in the 1970s. The book, which is based on the results of a survey of potential readers, will focus on implementing BMPs for grazing, irrigation, silviculture, and construction. This project is being carried out by the state soil conservation districts under a section 205(j)(5) grant.

Watershed Activities

- **Lake Tahoe:** A Water Quality Management Plan is underway to reverse the beginning

stages of eutrophication in Lake Tahoe and its basin, which was designated an Outstanding Natural Resource Water in 1968. Water quality problems result from urban runoff, construction activities, and other sources of soil erosion. Three major tools will be used to reduce nitrogen, phosphorus, and oil and grease loadings to the lake:

1. Basin-wide implementation of BMPs: BMPs are monitored for effectiveness and modified as necessary to ensure that the protective practices remain appropriate to the water quality goals of the plan. Monitoring data, collected since 1985, have been used to support revision of the BMP implementation process, to schedule the number of building permits issued, and to revise the basin's management plan.

2. Stream Environment Zone Protection and Restoration Program: Intrusions into stream zones may decrease their ability to filter surface runoff before it enters the lake. The primary mechanism for protecting and restoring these stream zones is land acquisition and subsequent restoration by federal, state, local, and private interests. The program also mitigates stream zone disturbance by requiring BMP implementation by development projects in and adjacent to the stream zones.

3. Erosion and Runoff Control Capital Improvements Program: This program is used to identify projects to control erosion and surface runoff on public rights-of-way in the basin. The Tahoe Regional Planning Agency then works with the state or local highway authority to implement the project in a manner that will protect surface water quality.

- **Truckee River Strategy:** The Truckee River provides water for numerous uses, including municipal and industrial use in the Reno/Sparks urban area and irrigation, power generation, and spawning ground for the threatened Lahontan cutthroat trout and the endangered Cuiui. The river drains into Pyramid Lake, a major sport fishery.

The Truckee water quality issues are controversial and complex, involving several federal agencies, the state of Nevada, local governments, the Pyramid Lake Paiute Tribe, Sierra Pacific Power Company, and individual water users. The Truckee is listed as water quality limited for nitrogen, nitrite, phosphorus, and fecal coliform on several of the reaches. EPA has required the state to perform a wasteload allocation and determine total maximum daily loads (TMDLs) for the consti-

uents in question. The sources of loading are disputed and a strategy has been devised to document the sources and allocate loading reductions fairly among the affected parties.

The strategy includes calibration of the Truckee River model, collection and evaluation of data, evaluation of sources and loads using monitoring data, and amendment of the Washoe County 208 plan to include a nonpoint source assessment in Truckee Meadows.

Additional activities in the basin include:

- Long-range planning for Sparks and Washoe Counties. Land use maps will be developed for the counties to project population and land use trends for the next 20 years.
- Evaluation of projected urban storm water loadings and agricultural runoff wasteloads.

- Brookside Golf Course Channel Improvement project to protect wetlands and construct sedimentation basins to reduce nonpoint source pollution in Steamboat Creek.
- Paradise Pond Project to construct a pond system designed for flood control, storm water detention, and water quality improvement.

Funding Summary

NDEP received \$212,750 in FY 1987 and FY 1988 205(j)(5) funds. The majority of funds were used to develop the nonpoint source management program. Funds were used for specific activities, including a nonpoint source assessment of the Truckee River and Steamboat Creek, updating the state BMP Handbook, a study of water quality monitoring on the Truckee River, and calibration of the Truckee River TMDL model.

REGION X

The Region's nonpoint source program goals and priorities during FY 1989 were to:

- assist states in developing and implementing effective nonpoint source assessments and management programs;
- assist states and federal agencies in effectively targeting, leveraging, and using available resources to solve nonpoint source problems;
- document the basis for and publicize successful water quality projects.

Nonpoint source assessments were approved for all Region X states (Alaska, Idaho, Oregon, and Washington). The lack of monitoring data and quantitative information were limiting factors for all states in developing assessments. States generally did a good job of supplementing monitoring data with professional evaluations to develop technically sound assessments. Alaska's assessment was the most controversial in obtaining support and credibility with interested and affected publics.

Riparian area degradation is the common denominator in many of the Region's most serious water quality problems. The major water uses identified as impacted by nonpoint source pollution in state assessments are fish habitat, shellfish contamination, wetlands, and water supply aquifers. State nonpoint source management programs are designed to address these and other water quality impacts.

Nonpoint source management programs were approved for Idaho and Washington and partially approved for Oregon. Alaska has not completed a management program by EPA's January 4, 1990, deadline. However, Alaska submitted a management program that was approved by EPA in September 1990. Oregon's program is completed only for agriculture. Implementation of Oregon's program relies on interagency action plans and agreements for applying nonpoint source controls.

State funding through the Agricultural Pollution Abatement Program in Idaho, the Centennial Clean Water Fund in Washington, and the Governor's Watershed Enhancement Board in Oregon have been instrumental in addressing high priority nonpoint source problems. The approved nonpoint source management programs rely significantly on these funding sources. Section 319 and other local, state, and federal funding will be used to complement the basic state sources and broaden the application of nonpoint source controls.

The Region X staff provided a variety of technical assistance and support to the states, including the following actions:



● Regional Office

- Participating in nonpoint source technical advisory committees in Idaho and Oregon and an Interagency Committee on Agricultural Water Quality, and Timber, Fish, and Wildlife Sub-Committees in Washington. The committees provide major input in the development and implementation of nonpoint source management programs. EPA's role is to ensure consistency with 319 requirements and guidance.
- Providing technical assistance, reviews, and recommendations to eight national forests in the development of monitoring plans as part of the National Forest Planning process to ensure that nonpoint source controls are applied, evaluated, and modified as needed to protect water quality.
- Conducting field reviews of nonpoint source projects and activities to assess application of best management practices and their effectiveness in protecting water quality. Better monitoring and evaluation of BMPs for water

quality effectiveness is a major need that should be addressed in watershed projects.

- Preparing a state-of-science report on *Monitoring Guidelines for Forest Practices and Water Quality Protection* intended for specialists and managers involved in monitoring forest practices. A draft report for public review will be completed in FY 1990; the final report in FY 1991.
- Reviewing the Rock Creek, Idaho, and Tillamook Bay, Oregon, Rural Clean Water Programs. Three of the many lessons learned from these projects are (1) local producers' leadership and involvement are essential for success; (2) cost-share funding is an important incentive for applying BMPs; and (3) documenting the on- and off-farm water quality benefits of BMPs are long-term and difficult tasks.
- The regional office was involved in a number of public outreach initiatives designed to reach affected publics who could become involved in information exchange and technology transfer.
- The Region prepared and distributed 200 copies of the report, *Effective Nonpoint Source Public Education and Outreach: A Review of Selected Programs in Region 10*. This report documented successful nonpoint source control projects. The Region also co-sponsored a conference on Protecting Our Wetlands: Education, Insight, and Action. The objectives included providing an initial forum for states to build upon in carrying out their nonpoint source management programs.
- The Region also developed a pollution prevention initiative for Agricultural Chemicals and Water Quality Protection to prevent agricultural chemical pollution through research, education, and demonstration of BMPs and integrated pest management techniques. The final work plan and projects selected for funding were to be completed in FY 1990.

ALASKA

Alaska has not completed its nonpoint source management program proposal. This failure is due to the low priority assigned to this task by the State's Department of Environmental Conservation (DEC), which historically has assigned a low priority to nonpoint source controls.

Because of the public controversies surrounding the accuracy and credibility of the draft nonpoint source assessment, completion of this report is requiring much more time than the agreement between the state and EPA anticipated. DEC is continuing to develop a nonpoint source management program and intends to submit it to EPA in 1990.

IDAHO

The Idaho Department of Health and Welfare's Division of Environmental Quality (IDHW) is the state agency that implements section 319 programs in Idaho. Other agencies that manage the control of nonpoint sources are described in the state nonpoint source management program, which was developed by a technical advisory group representing a wide range of public interest in the issue.

The goal of the program is to develop and implement effective nonpoint source control strategies to protect existing beneficial uses, restore affected waters to the extent practicable, and maintain high quality waters. To accomplish this goal, the state is building on existing programs and authorities, identifying program needs, and listing opportunities for federal financial assistance.

Specific objectives include developing a coordinated nonpoint source monitoring program, developing BMPs for nonpoint source categories not currently listed in the state's management program, and evaluating BMPs to determine how well they protect ground-water quality.

Implementation of nonpoint source controls for agriculture and forest practices continued concurrently with the completion of the management program. The agriculture program is voluntary and relies largely on the Agricultural Water Quality Cost-share Program, which helps farmers apply BMPs. The forest practice program is regulatory and is based on the state's Forest Practices Act. Nonpoint source implementation efforts since 1980 have focused primarily on nonpoint source controls for agricultural and forest practices. Following is a list of specific activities:

- **Antidegradation Policy:** a policy supported by the enabling legislation that requires public participation in efforts to identify stream segments of concern in each basin in the state. The final list of segments of concern will be completed in FY 1990 and will be the basis for the state's Clean Water Strategy.
- **State Agricultural Water Quality Cost-share Program:** includes the funding of 21



A shallow creek tumbles over rocks.

planning projects and 25 implementation projects since 1980 and financing the treatment of approximately 600,000 acres to reduce water quality impacts. Of the 25 implementation projects, 20 are in non-irrigated areas, five in irrigated areas. High priority needs identified in the management program include broadening of the program's application to include livestock grazing, riparian area management, and livestock management. Section 319 funding will be used to assist in evaluating and re-directing the Agricultural Water Quality Cost-share Program.

- **Forest Practices:** The Idaho Forest Practices Water Quality Management Plan was revised in 1988. The revisions made the plan consistent with changes in agency programs and updates in the state's water quality standards for nonpoint source activities.

The 1988 field audit of 25 sites throughout the state found that compliance with the Forest Practices Rule was generally high on federal, state, and industrial forests but poor on non-industrial private land. BMPs were effective in preventing delivery of sediment to

waterbodies; water quality declined when BMPs were not used.

- **Rock Creek Rural Clean Water Program:** demonstrated that serious nonpoint source water quality problems can be effectively addressed. Results to date indicate that BMPs implemented under the RCWP have improved water quality in Rock Creek. The sub-basins with the greatest percentage of BMPs also show the greatest reductions in suspended sediment and other agricultural pollutants. Fish populations in Rock Creek have increased since the beginning of the project.

Preparation of the management program was completed in November 1989. However, except for the Rock Creek RCWP, water quality improvements have not been documented. A coordinated statewide water quality monitoring program is a high priority for the management program.

OREGON

The goal of Oregon's nonpoint source program is to prevent or control nonpoint source pollution so that none of the designated uses of water is impaired by that pollution. In pursuit of this goal, the state nonpoint source program identifies issues and problems, assesses levels of designated use support, defines solutions, sets priorities, contributes to public education programs, assists with funding, coordinates interagency cooperation, and evaluates program achievements. Actual implementation of appropriate land management practices generally is done by other agencies or by groups of agencies working together.

The state's nonpoint source program workplan for 1990 includes over 25 program elements, many of them designed to coordinate with or provide direct assistance to other water quality protection or natural resource management programs in the Department of Environmental Quality (DEQ) and in other local, state, and federal agencies.

Statewide Activities

- **Agreements and Action Plans:** nonpoint source agreements with the major forestry, agricultural, and grazing agencies will facilitate nonpoint source control programs on most lands in Oregon. New memoranda of agreement with ASCS, SCS, and the Oregon De-

partment of Agriculture were signed in the spring of 1989. New MOAs are expected with BLM and the Forest Service in February 1990 and with the Oregon State Department of Forestry in the spring of 1990. Attached to each MOA is an action plan that describes and ranks the site-specific projects that address the most important nonpoint source issues within each agency's jurisdiction.

■ **Monitoring, Assessment, and Evaluation:** Oregon's Department of Environmental Quality is developing a statewide nonpoint source assessment and monitoring strategy that, when implemented, will give DEQ the information it needs to describe nonpoint source problems in detail and with a high degree of confidence. A major component of the strategy will be the use of various bioassessment techniques to provide affordable yet relatively detailed assessments of designated use support levels and trends. DEQ also will help other agencies develop and implement nonpoint source assessments and monitoring programs and will analyze data collected by these agencies.

■ **Coordinated Resource Management and Planning:** Interagency coordination is a principal vehicle for integrating and applying the goals of the nonpoint source management plan. Through this coordination, DEQ is able to take the lead on identifying problems, ranking projects, selecting solutions, and monitoring the effectiveness of resource management operations throughout the state.

■ **Intergovernmental Reviews:** Many federal, state, and local project proposals are routed to the department's nonpoint source program each year for evaluation. These reviews provide an excellent opportunity to raise water quality issues and prevent pollution problems before work has begun on a site. Intergovernmental reviews are a major vehicle for implementing nonpoint source controls and rely heavily on effective assessment and monitoring.

Watershed Activities

■ **Critical Basins:** are those in which a waterbody has been identified as "water quality limited" under section 303 of the Clean Water Act. The nonpoint source program's contribution to the critical basins program is to work with local designated management agencies to pre-

pare watershed management plans addressing forestry, agriculture, grazing, and urban storm water runoff.

Oregon is in the very early phase of implementing the agricultural element of its approved nonpoint source management program. Water quality improvements have not been documented. Section 319 funds were used in FY 1989 to develop and begin implementation of the section 319 reports.

Funds available through section 319 are a critical element in turning Oregon's nonpoint source management program into water quality protection realities in watersheds throughout the state. The department has identified eligible projects and requested funding from EPA.

WASHINGTON

The Washington Department of Ecology (DOE) is the lead agency for developing and implementing section 319 projects in the state. The state's nonpoint source management program consists of four levels based on available implementation funding, with each level adding more complex and costly programs. Together, the four levels will result in a comprehensive statewide nonpoint source program.

Level 1 of the management program will be implemented in Fiscal Years 1989 and 1990. The program priorities for this level are:

- Developing a statewide education program covering nonpoint source pollution that affects both surface water and ground water.
- Reducing water quality impacts of irrigated agriculture on the lower Yakima River Basin by funding watershed planning and technical assistance.
- Coordinating state nonpoint source programs with Indian tribes.
- Ensuring federal program consistency with the state management program.
- Developing and implementing a state pesticide and nutrient management plan for ground-water protection.
- Providing ongoing coordination of state programs for ground water, forest practices, and agriculture.

The state has hired staff to administer education programs and to provide for the agency coordination called for in the management program.

To address one of the state's major sources of nonpoint source pollution, an interagency committee for agricultural water quality has been formed. The committee, which first met in July 1989, has been instrumental in helping DOE develop its FY 1990 work program for section 319 funding.

Implementation of a memorandum of agreement on agricultural compliance between DOE, the State Conservation Commission, and local conservation districts continues. Staff positions critical to implementation have been filled and the coordination necessary for the MOA to work effectively at the local level is progressing. Most conservation districts have signed the MOA, and there is a general attitude of optimism as water quality problems resulting in complaints begin to work their way through the process.

Conservation districts provide technical assistance to operators. The commission provides policy and financial and coordination assistance to districts. DOE provides the regulatory compliance backup to ensure that water quality is protected. Centennial Clean Water Funds, administered by DOE and the Conservation Commission, continue to support watershed planning and water quality projects throughout the state. Project proposals from not-for-profit groups are requested and funded annually.

Section 319 funds will supplement state monies and allow additional nonpoint source controls to be applied. In addition to supporting existing watershed management work, these funds allow additional watersheds to begin the planning process. Projects providing direct technical assistance to landowners dealing with such concerns as livestock waste management, irrigation water management, and dryland erosion control have been initiated or continued with these funds.

The Timber, Fish and Wildlife agreement is a cooperative effort by Indian tribes, industry, environmental groups, and state agencies to protect resources during forestry operations. This agreement is more than halfway through its second year; its major accomplishments for 1989 were:

- Establishing 16 projects to study the effects of various silvicultural activities upon water quality and fish habitat. Total budget is about \$1.9 million.

- Establishing interdisciplinary teams to review plans of operation under the agreement. About 1,200 plans were reviewed in 1989, with field reviews done on about 20 percent of them.
- Developing a morphology-based stream classification system for the state. The system will be used to assist in reviewing forest practice operation plans.

Only funds from existing state programs were available for watershed projects in FY 1989. Nevertheless, the state made progress in implementing the program. For example, as a result of the Puget Sound Water Quality Management Plan, all watersheds in the Puget Sound basin were ranked to set priorities for a plan to control nonpoint source pollution. Concurrently, 12 "early action" watershed management plans were developed by local committees. These plans are in varying stages of review, revision, and implementation.

Implementation in FY 1989 concentrated on:

- increasing public awareness of the need for nonpoint source controls;
- providing information to residents on their roles in preventing or correcting nonpoint source problems; and
- working with technical assistance agencies to establish priorities and target areas for their work.

Actions identified in the watershed plans range from education and information outreach to providing technical assistance to landowners. The watershed plans are reviewed by the public and approved by the DOE.

Washington is in the very early phase of its nonpoint source management program and is using federal nonpoint source grants to develop the section 319 reports and begin implementation. The management program includes an extensive list of actions needed to solve nonpoint source problems. It will be some time before water quality improvements stemming from the program can be documented.

V. Related EPA Programs

It is impossible to obtain a complete picture of EPA and state efforts to control nonpoint sources by focusing solely upon section 319 programs and their implementation. One must also consider the broad range of other activities conducted by EPA and the states, including:

- establishment of criteria and standards,
- monitoring and data analysis,
- control of storm water runoff, concentrated animal feeding area runoff, mining runoff, and other activities that lie at the interface of point and nonpoint source programs,
- resource protection programs (e.g., Clean Lakes, Wetlands Protection, and Marine and Estuarine Protection programs),
- watershed protection programs (e.g., the Great Lakes and Chesapeake Bay programs), and
- drinking water, ground-water protection, and pesticides programs.

This section discusses some of EPA's national programs and activities that assist in nonpoint source pollution control.

Ground-water Protection Programs

EPA's Ground-water Protection Programs provide technical and financial support to several state ground-water programs related to nonpoint source pollution control. Since 1984, Ground-water Protection has provided technical and financial assistance to states for the development of state ground-water strategies and, more recently, Ground-water Protection Programs. In addition, Ground-water Protection administers the Wellhead Protection Program and the Sole Source Aquifer Program under the Safe Drinking Water Act.

In many states, the institutional structure for ground-water programs is in a developmental phase. Ground-water Protection places emphasis on activities that promote the development of institutional capacity, including technical assistance and grants to states for the development of data management systems, techniques for ground-water resource assessments and classification, and other technical information related to ground-water protection. These activities by states can be supportive of state nonpoint source programs, particularly for selecting priorities for source mitigation efforts. Other Ground-water Protection activities support EPA's nonpoint source pollution control efforts. For example, Ground-water Protection is conducting an analysis of methods used for estimating nonpoint source contamination of ground-water discharge to surface water. Ground-water Protection is also preparing a technical assistance document that reviews methods of determining aquifer sensitivity to agricultural sources of pollution.

Wellhead Protection Program

The 1986 Amendments to the Safe Drinking Water Act (SDWA) established a Wellhead Protection Program. This program was created to protect ground waters that supply wells and wellfields that contribute to public drinking water supply systems.

Under SDWA section 1428, each state was required to prepare a Wellhead Protection Program and submit it to EPA by June 19, 1989. Although the law requires that every state program must contain specific elements, EPA recognizes that states should be given flexibility to tailor program details to best suit their individual needs and circumstances. To assist states in developing Wellhead Protection Programs, EPA has provided numerous technical assistance documents, held a national wellhead conference, and is sponsoring workshops in several locations throughout the country.

Where the Wellhead Protection Program is linked to state nonpoint source management programs, section 319 implementation activities for ground water can support these ground-water initiatives. If properly targeted, the nonpoint source program can be an effective tool to help control sources of ground-water pollution. Likewise, control efforts to protect wellfields complement nonpoint source efforts to prevent surface water degradation.

Drinking Water Programs

Watershed Control Program

Drinking Water Programs promulgated the final Surface Water Treatment Rule (SWTR) on June 29, 1989. That rule required operators/owners of public drinking water systems using surface water sources (or ground-water sources under the direct influence of surface water) to establish and maintain effective watershed control programs as one condition of avoiding water filtration requirements. The objective is to minimize potential watershed contamination so as to prevent contamination of drinking water. The control programs, prepared by the utilities responsible for the systems, are subject to state approval, review, and annual evaluation.

Under the new regulations, the watershed control program must, at a minimum:

- characterize the watershed hydrology and land ownership;
- identify watershed characteristics and activities detrimental to water quality, including natural occurrences (precipitation, soil types, and land cover) and point and nonpoint sources of pollution; and
- identify, monitor, and control activities that may have an adverse effect on source water quality.

After receiving approval of a watershed control program, the utility must submit annual reports to the state identifying any special concerns (e.g., new construction) or activities in the watershed that have the potential to affect source water quality and must describe how such concerns were or will be handled. In addition, the report must project future possible adverse impacts on the watershed and describe how the utility expects to address them.

Although there are currently 3,000 unfiltered surface systems serving 21 million people, it is estimated that less than 500 systems will meet all the criteria — including preparation of a watershed control program — necessary to avoid filtration. Drinking Water Programs hope states will encourage utilities that must use filtration to prepare watershed control programs to address other water quality concerns that may affect the utilities' water treatment costs.

State nonpoint source control programs are likely to benefit from the activities required in developing, maintaining, and reporting on watershed control programs. These programs will help protect surface water quality, and annual reports to states on watershed activities will assist state nonpoint source control agencies in assessing statewide water quality and documenting improvements resulting from these activities. States may choose to monitor the utilities' success while targeting state resources and federal funds for nonpoint source control to other watersheds (e.g., those serving public water systems that are filtering and thus are not required by the SWTR to have a watershed control program).

Pesticide Programs

Pesticide Programs have released the Pesticide and Ground Water Strategy, which defines EPA's pesticides management goal as the prevention of unacceptable contamination of ground water and defines the management approach.

Pesticide Programs and the Drinking Water Programs jointly conducted a two-year National Pesticides Survey of drinking water wells to determine the frequency of pesticide contamination (and other parameters, including nitrates) and to examine how contamination patterns relate to pesticide use and ground-water vulnerability. The National Pesticide Survey sampled 750 domestic and 600 community drinking water wells for 126 pesticides and analytes. EPA released the survey results in 1990.

An EPA report based on results of the National Survey estimates that 10 percent of the nation's community drinking water wells and about 4 percent of rural domestic drinking water wells have detectable residues of at least one pesticide. But less than 1 percent of the wells have pesticide residues above levels considered protective of human health. In the report, EPA also estimates that more than half of the nation's wells contain nitrates, with about 1.2 percent of the community wells and 2.4 percent of the rural wells showing detections above the 10 parts per million maximum contaminant level established to protect human health. Additional publications associated with the survey include:

- technical advisories and one-page summaries on 60 primary pesticides covered by the survey, and
- a brochure entitled *Pesticides in Drinking Water*, scheduled for release in FY 1990.

Pesticide Programs have also prepared a Pesticides in Ground-water Database that contains reports on monitoring studies carried out over the past 10 years by pesticide registrants, universities, and governmental agencies in the United States. Pesticide Programs recently released an interim report on the number of pesticide detections in ground

water. That paper reported that over 70 pesticides have been detected in the ground water of 38 states. Of these, 46 pesticides in 26 states were found to be in ground water from normal agricultural use, while 32 were attributed to point sources in 12 states.

The Pesticide Monitoring Inventory is a compilation of monitoring projects being performed by federal, state, and local governments and private institutions. Reports are collated by Pesticide Programs and the information is publicly available by direct access using a modem.

Pesticide Programs require ground-water and surface water monitoring studies for targeted pesticides as part of the registration process. Pesticide Programs provide guidance to registrants for the design and implementation of monitoring studies and provides the expertise to assess the adequacy of the data generated. Pesticide Programs guidelines for monitoring studies include:

- requirements on the types of studies and when to conduct them;
- designs for different types of monitoring studies;
- information on monitoring well construction, well sampling, soil sampling, and quality assurance measures; and
- information on how to conduct leaching assessments.

Pesticide Programs has proposed a rule to expand the restricted use classification of pesticides on the basis of a pesticide's potential to contaminate ground water. The rule proposes to add criteria regarding particular physical characteristics of some ingredients and actual detection in ground water of those ingredients to existing criteria for classifying pesticides. To be eligible to apply a restricted use pesticide, the user must complete a specific training program.

Pesticide Programs will continue to coordinate with the various EPA, USDA, and USGS offices that address ground-water contamination by pesticides to ensure that research, education, and policy complement each other.

Clean Lakes Program

The Clean Lakes Program was created in 1976 to establish methods and procedures to protect and restore publicly owned freshwater lakes. In 1980, the Clean Lakes Program regulations were issued and since then over 400 cooperative agreements have been awarded to states for the classification, assessment, study, and restoration of lakes. These agreements are subject to the General Grant Regulations (40 CFR Part 30), the Clean Lakes Regulations (40 CFR Part 35 Subpart H), and the Clean Lakes Program Guidance (December 1987).

Four types of cooperative agreements are available under the Clean Lakes Program:

- **Cooperative Agreements for State Lake Water Quality Assessments:** The purpose of these grants, awarded in FY 1989, is to fulfill the reporting requirements under section 314(a)(1) of the act.
- **Cooperative Agreements for Phase I: Diagnostic/Feasibility Studies:** These studies investigate the causes of the decline in quality of a publicly owned lake and determine the most feasible procedure for protecting and restoring the lake.
- **Cooperative Agreements for Phase II Projects:** These projects implement the recommended methods and procedures for controlling pollution entering a lake and for restoring or protecting a lake. Phase II agreements follow Phase I studies or equivalent investigations.
- **Cooperative Agreements for Phase III Studies:** Post-restoration monitoring cooperative agreements offer selected projects the opportunity to conduct long-term, post-restoration monitoring studies to verify the longevity and effectiveness of various restoration techniques.

Program Interaction

The Clean Lakes regulations require that any lake project must be consistent with the state Water Quality Management Plan (40 CFR Part 35). This is to ensure that EPA and the states coordinate a variety of programs under the Clean Water Act, the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and other laws administered by EPA. The Clean Lakes Program is conducive to integration with other water quality management programs because of the natural linkages between lake management and other environmental efforts.

As specified in the Clean Lakes Program Guidance, Clean Lakes projects need to be developed and implemented on a watershed basis. The Guidance further states that this geographical approach to water quality management has been identified as a key element of success in nonpoint source control, ground-water protection, water quality-based permitting, storm water permitting, estuarine protection and cleanup, and wetlands protection. In awarding cooperative agreements under the competitive Clean Lakes Program, those projects with a watershed-based approach to water quality management are favored.

A comprehensive approach to lake management is essential because pollutants generated by both nonpoint sources and point sources affect lakes. To ensure success, lake restoration projects often require nonpoint source control activities. In fact, many states have used the Clean Lakes Program as a nonpoint source management tool. For example, a number of projects have included best management practices to prevent pollutants originating in the watershed from entering lakes. Several projects have used storm water retrofitting to control urban runoff. Still others have used wetlands to buffer and filter pollutants that might enter lakes from agricultural, silvicultural, and urban areas.

Although section 314 funds can be applied to control nonpoint sources of pollution, the Clean Lakes regulations prohibit using Clean Lakes funds to control discharge of pollutants from a point



Vegetation has been plugged into this slope to prevent erosion.

source where the cause of pollution can be alleviated through actions authorized by sections 201 or 402 of the Clean Water Act.

The Implementation Memorandum for the FY 1990 Clean Lakes Program suggests that EPA regional offices (who have been delegated authority to enter into Clean Lakes cooperative agreements with the states) encourage states to integrate their Clean Lakes projects with other state and federal programs. This memorandum also encourages states to consider technical and financial assistance that may be available through section 319 state nonpoint

source programs for targeted watershed demonstration projects. Finally, the memo mentions that U.S. Department of Agriculture P.L. 83-566 projects may offer assistance in watersheds significantly affected by agricultural nonpoint source pollution.

Regional allocations for the Clean Lakes Program appropriation for FY 1990 were determined based on various factors, including the relative impacts of nonpoint source pollution on lakes. This factor was considered important because of the high percentage of the nation's lakes affected by nonpoint source pollution.

Marine and Estuarine Protection Programs

Nonpoint source pollution is a major contributor of contaminants to estuary and coastal waters around the country. Estuaries, bays, and the coastal ocean are the receiving waters for runoff from city streets, golf courses, suburban developments, parking lots, and farms located within coastal watersheds. These watersheds drain not only coastal areas but also those far upstream.

Nonpoint source pollution of estuaries and coastal waters is of concern because these environments are highly productive and sensitive ecosystems. They provide habitat for many commercially and recreationally significant fish and shellfish as well as endangered birds, marine mammals, and other wildlife.

They are also home and playgrounds for an increasingly larger proportion of our nation's population — 75 percent are expected to live in coastal areas by the year 2000.

EPA's National Estuary Program (NEP), authorized under section 320 of the Clean Water Act of 1987, is a national demonstration program that uses a comprehensive watershed management approach to address water quality and habitat problems in 17 estuaries spanning the Atlantic, Gulf, and Pacific coasts. Under the act, management conferences—consisting of federal, state, and local agencies, scientists, citizens, industry, and environmental groups—are to develop Comprehensive Conservation and Management Plans within five years. These plans should address toxic and pathogen contamination, nutrient overenrichment, habitat loss or alteration, impacts to living resources, and other problems from point and nonpoint source pollution and physical alterations (e.g., dredging, construction).

NEP demonstration projects are already underway; they address a wide range of nonpoint source issues in their estuaries:

- **The Buzzards Bay Project** in Massachusetts is installing two different kinds of storm water detention systems to test ways to reduce bacterial contamination of a small embayment, Buttermilk Bay.
- **The Land Management Project** in Rhode Island is conducting three major nonpoint source projects for Narragansett Bay involving watershed planning and technical assistance to local communities on state-of-the-art BMPs and innovative regulatory activities.
- **The Long Island Sound Study** is evaluating methods to reduce storm water flow into Mamaroneck Harbor with the goal of achieving water quality levels that will keep nearby beaches open for swimming. Through the project, the Connecticut Department of Environmental Protection, SCS, and the Litchfield County Soil and Water Conservation districts are helping 27 farmers develop nutrient and erosion control plans.
- **The Delaware Estuary Program** is funding the Chester County Conservation District to work with farmers to reduce pesticide use in the Red Clay Creek Basin. Technical assistance is being provided by SCS and Extension Service.
- **The Albemarle/Pamlico Project** is cooperating with Virginia's SCS to institute animal waste BMPs in the Chowan River basin.
- **The Sarasota Bay Project in Florida** is working with the two counties in the bay's watershed to establish storm water utilities. The project has also published a *Bay Repair Kit* for the public on reducing nonpoint source pollution.
- **The San Francisco Estuary Project** is testing the feasibility of using created wetlands to treat storm water before it enters the bay.



This photograph taken in the Albemarle/Pamlico Sound, illustrates both the human and aquatic resources nurtured by the nation's estuaries.

■ **The Santa Monica Bay Program** has held workshops for local governments on urban storm water and has produced a *Ninja Turtles* comic book for the public on improper disposal of materials into storm water drains. The program is using 319 funds to contract with Los Angeles County to conduct a public opinion poll on the impact of nonpoint source pollution. The poll will be used to evaluate educational needs and determine which BMPs succeed most with the public.

■ **The Puget Sound Water Quality Authority in Washington State** has developed a handbook for local governments and instituted an early action watershed program for nonpoint source management for the Puget Sound Estuary Program. The program has three demonstration projects dealing with storm water:

- a wetland acquisition and storm water treatment project to control drainage from a shopping mall,

- a storm water diversion and sediment entrapment project for a creek in the watershed, and

- a project to develop measures for protecting shellfish beds from nonpoint source bacterial contamination.

EPA also funded several pilot demonstration projects that address nonpoint source pollution problems in selected coastal waterbodies. The Cornell Extension Service is constructing a small artificial wetland to treat street runoff in Peconic Bay, New York. A project involving county governments around Monterey Bay, California, is demonstrating the use of agricultural BMPs to reduce pesticide runoff into the Salinas River. Follow-up monitoring will assess the effectiveness of the BMPs. An ongoing project in Oregon's Coquille Estuary received extra funding under USDA's water quality initiative to address identified nonpoint source impacts from livestock grazing.

Research and Development Programs

Research and Development Programs have a long history of support for nonpoint source control programs. One of the more popular products of this effort has been the development and support of a series of models for quantification of urban, agricultural, and mining sources of pollutant runoff to lakes and streams. During FY 1989, Research and Development's nonpoint source research efforts were largely directed to providing maintenance and user support for those models, to developing a global environmental assessment tool known as EMAP, and to providing direct technical assistance to state and local nonpoint source decision-makers. This year also saw the beginning of efforts to develop the basic spatial framework and data-bases to validate models and/or proper model weighting coefficients on a regional basis. An illustrative list of activities follows:

- **Minnesota River Assessment Project:** a comprehensive study to define existing physical, chemical, and biological conditions and the nonpoint source loadings in the Minnesota River Basin. This project is directed at one of the immediate needs of the Office of Water: to develop methods and protocols to detect and assess the impacts of nonpoint source pollution. The first phase was diagnostic assessment and problem identification. Phase two begins with an implementation plan describing best management practices to reduce nonpoint source loadings.
- **Microbial Biological Control Agents:** Research and Development is engaging in a series of studies to determine how microorganisms affect freshwater ecosystems. Research and Development's immediate goal is to develop acute and chronic laboratory tests that expose target and non-target invertebrates and fish to bacteria used to kill insect pests that live in water. These tests include both single species and microcosm level tests. The data from these tests are being evaluated by measurements in natural systems currently being treated to control the pests. The

long-range goal is to understand how populations and communities respond to the introduction of microorganisms. This information will be useful in understanding the impact of natural and genetically engineered microorganisms introduced from any source.

- **Sediment Quality Criteria:** Research and Development has undertaken research to establish safe sediment concentrations of chemicals by determining the sediment chemical concentration that will result in acceptable tissue residues in aquatic organisms. Specific toxic and/or bioaccumulative components from impacted ecosystems will be identified and quantified. Based on water and sediment criteria, predicted acceptable and unacceptable conditions will be determined and evaluated using ambient toxicity tests and bioaccumulation and ecological survey data.
- **Protocol for Assessment of Pesticides:** Research and Development has begun field validation of a protocol for assessing the effects of pesticides on ecosystems. The test protocol calls for using littoral enclosures. Under the protocol, at least 12 littoral enclosures are required to evaluate a pesticide. One can measure both primary and secondary (ecological) effects of a pesticide application on selected fish species. The system is designed to investigate changes at the population and community levels in plants, decomposition of invertebrate leaf litter, and nutrient cycling. Decomposition rates can be measured and used to estimate ecosystem stress resulting from pesticide application.
- **Ambient Toxicity Tests:** Laboratory ambient toxicity tests are being conducted using both overlying surface water and sediment pore waters from the Fox River/Green Bay watershed and the upper Illinois River watershed. Evaluations are using both animal and plant protocols. Results from these laboratory

tests will be compared with other in-stream biological results to determine levels of agreement on impaired waterbody reaches. The laboratory tests may serve as short-cuts to determine impairments.

- **Water Quality Criteria for Wetlands:** Research and Development's laboratory in Duluth has the responsibility to develop and evaluate wetland water quality criteria. This laboratory is assessing (1) the applicability of current aquatic life criteria to wetlands, (2) the effects of pollutants of concern on wetland health, and (3) the effects wetlands have on the water quality of aquatic resources downstream. The intent is to use the criteria to protect the structural and functional integrity of the wetland. A secondary goal is to establish pollutant loading rates that will neither disrupt the long-term health of the wetland nor jeopardize its value to the ecosystem.

- **Nonpoint Source Modeling:** A report was prepared that reviews and discusses nonpoint source assessment procedures and modeling techniques for both urban and non-urban areas. Overview and detailed reviews of specific methodologies and models are presented. Simple procedures such as constant concentration, regression, statistics, and loading function approaches are described along with complex models such as SWMM, HSPF, CREAMS, SWRRB, and others. Brief case studies of ongoing and completed modeling efforts are described. Recommendations for nonpoint runoff quality modeling are presented to elucidate expected directions of future modeling efforts.

- **Development of a Research Approach for Separating the Impacts from Point and Nonpoint Sources of Pollution:** This new project, now in the early stages of development, could become a keystone in the nonpoint source control effort.

Research will be conducted to develop and improve diagnostic methods for comparing point and nonpoint source pollution on a watershed basis. Laboratory toxicity, habitat identification, physical and chemical analyses, land use, and biosurvey procedures will be used to identify sources and the severity of degradation. Fluxes of major pollutants into and out of watershed ecosystems and their ecological impacts will be modeled for use in determining BMPs and setting regulatory strategies.

- **Development of Freshwater Quality Criteria:** Guidelines have been established for deriving water quality criteria and advisories for freshwater and saltwater organisms. Presently, criteria development may be approached on a chemical-specific or whole effluent basis. Using the chemical-specific approach, criteria can be applied directly to develop water quality standards. Using the whole effluent approach, the chemical causing adverse effects is identified and then concentrations are reduced to an acceptable level by some physical means. Once mechanisms are established to identify nonpoint sources of toxic chemicals and their potential adverse effects, nonpoint source chemicals can be regulated through these approaches. New procedures now being developed, such as biocriteria and wildlife criteria, will also be used to develop a framework and strategy for nonpoint sources of pollution.

This has been an organizing year for nonpoint source research. In consideration of the five themes of the Nonpoint Source Agenda, Research and Development has begun to focus on Number 2, Successful Solutions, and Number 5, Good Science. Successful Solutions activities will, in particular, develop measures of effectiveness for predicting and quantifying success of individual management practices, such as agricultural practices like low-till and no-till. Under the theme Good Science, decisionmaker tools will be developed for implementation needs, including determining TMDLs and establishing water quality standards that better address nonpoint source problems with a focus on narrative, numeric, sediment, and biological criteria.

Research and Development proposes to begin developing defensible methods for designing best management practices that will specifically protect water quality against pesticides, nutrients, low dissolved oxygen, sediment loadings, and other pollutants. Assessment of the extent of nonpoint source problems and the effectiveness of remediation has been problematic because of natural environmental variability. Therefore, at the heart of the Agency's research strategy is a plan for developing a data analysis and interpretation framework based on natural biogeoclimatic similarities of the landscape.

Around this framework, Research and Development proposes to structure assessment methods to evaluate proposed agricultural management policies and production techniques and to identify environmentally relevant and attainable water quality in intensively farmed watersheds and basins. Evaluations will produce lab and field protocols for measuring pollutant reductions as functions of BMP type

and regional characteristics. The basis of design criteria for effective BMPs, these protocols will help alleviate one of the major problems identified as early as 1984 in the nonpoint source report to Congress—no suitable framework for interpreting results. Where BMPs fail to produce reasonably attainable regional water quality conditions, alternative cropping practices and land uses will be reevaluated.

The Agency has a wealth of single-issue and single-medium databases, representing a tremendous investment. Future Research and Development supports will include development of a systematic program of data integration and analysis. The objective is to produce GIS-based support for environmental decision modeling so that EPA will have the tools needed to develop optimal management alternatives for national or regional environmental challenges. This information system will support assessing agriculture management scenarios tailored to specific regional ecologic/economic conditions. The tools will be geared to both state and local decisionmakers and oriented to pollution prevention and contingency management. Available and newly developed software will be used to meet the spatial analysis, statistical analysis, modeling, and data conversion needs of the system.

Solid Waste Programs

EPA's Solid Waste Programs are active under the Resource Conservation and Recovery Act (RCRA) pertaining to the management of hazardous waste at land disposal facilities and of solid waste at mining sites and at oil and gas exploration and production sites throughout the United States. Solid Waste is working with the states to develop national programs for improved management of mining, oil, and gas wastes under RCRA Subtitle D. These programs will have impacts on the control of nonpoint source pollution.

EPA issued two final rules regarding mineral processing wastes (54 FR 36592, September 1, 1989, and 55 FR 2322, January 23, 1990) and released a mineral processing waste report to Congress on July 31, 1990. The related regulatory determination for mineral processing wastes was made in June 1991.

For mining waste, Solid Waste is participating in a policy dialogue committee to develop an approach to mining waste management that will be safe, cost effective, and flexible. Solid Waste has also worked with the Office of Water during the development of the storm water runoff rule, particularly in how it would affect mining.

EPA's Report to Congress on wastes from exploration and production of crude oil and natural gas was released in December 1987. The subsequent regulatory determination was published on July 6, 1988 (53 FR 25446). The regulatory determination indicated that EPA would (1) improve federal programs under existing authorities in Subtitle D of RCRA, the Clean Water Act, and Safe Drinking Water Act, and (2) work with states to encourage changes in their regulatory and enforcement programs.

Solid Waste Programs have provided a grant to the Interstate Oil Compact Commission (IOCC) to develop a set of IOCC guidelines for states to consider in making improvements to their existing programs pertaining to oil and gas exploration and production wastes. These guidelines were completed in 1991. A number of follow-up activities by IOCC for implementation of the guidelines have also been funded by Solid Waste.

Solid Waste also has developed an extensive regulatory framework under RCRA to regulate the land disposal of hazardous wastes. These regulations are found in the Title 40 Code of Federal Regulations (CFR) Parts 264, 265, and 268. A number of the Solid Waste regulatory programs potentially impact nonpoint source pollution by providing controls on waste units and by providing for cleanup of contaminant releases. These programs include technology standards for landfills and surface impoundments (RCRA section 3004(o)), pre-disposal treatment of waste under the land disposal restriction regulations, and location standards for hazardous waste management units (40 CFR 264.18).

Solid Waste is currently working on a notice of proposed rulemaking that will strengthen the existing standards for locating and siting hazardous waste treatment, storage, and disposal facilities to further mitigate the potential effects of contaminant releases caused by natural disasters at waste management units. Additionally, a corrective action rule has been proposed (55 FR 30798, July 27, 1990) that would provide for cleanup of contaminant releases from solid waste management units.

Wetlands Protection Programs

In addition to acting as natural filters for nonpoint source pollution, wetlands also provide many other benefits, including aquatic habitat for commercial fisheries, wildlife habitat, flood and erosion control, and shoreline stabilization. While they are valuable resources to be protected from nonpoint source impacts (i.e., agricultural and urban runoff, hydrologic modifications), they also provide a nonpoint source control function. Wetlands have been demonstrated to prevent sediment, nutrients, and organic contaminants from entering adjacent waterbodies such as lakes, rivers, and estuaries. While monitoring and research are needed to ensure that wetlands used to buffer nonpoint source pollution are not adversely affected themselves and the use of such wetlands does not result in pollutants entering ground water, the use of artificially created wetlands can be a cost-effective means of achieving nonpoint source control goals.

Section 319 requires states to perform nonpoint source assessments that identify "waters of the U.S." that are impaired or threatened by nonpoint source pollution as well as the activities causing the impacts. Even though the definition of "waters of the U.S." includes wetlands, only a few states have included wetlands in their assessments of waters impacted by nonpoint source. State assessment efforts have been hampered by inadequate data designed specifically to address nonpoint source impacts to surface waters. Data on nonpoint source impacts to wetlands are particularly lacking. State section 319 programs should continue to improve assessments of nonpoint source impacts to wetlands as part of their wetlands and nonpoint source programs.

Wetlands Protection Nonpoint Source-related Activities

- **Efforts with Other Federal Agencies:** The Wetlands Program is working with several agencies to explore ways to protect and restore

wetlands in ways that can be expected to reduce nonpoint source impacts on surface water.

- **Wetlands Protection is currently developing joint agendas with the Soil Conservation Service, Extension Service, Forest Service, and Bureau of Land Management** to improve wetlands and riparian habitat management on public and private lands through outreach and information transfer.
- **Wetlands Protection is working actively with members of the Interagency Task Force on Floodplain Management** to better protect and enhance the natural and beneficial values of the nation's floodplains.
- **Wetlands Protection has been working with the National Park Service and a nonprofit group** (Association of State Floodplain Managers) to promote the concept of comprehensive or multi-objective river corridor management. Managing river corridors for multiple uses provides the opportunity for communities to simultaneously address nonpoint source pollution, water quality, flooding, recreation, habitat, and any number of needs and challenges.
- **Wetlands Protection is initiating a pilot project** with the Marine and Estuarine Protection Programs and the National Park Service to link river corridor activities high in the watershed with the National Estuary Program.
- **Development of Curricula and Outreach Materials:** To equip educators with the tools necessary to improve student awareness of the important role wetlands play in improving water quality, Wetlands Protection is working

with other EPA offices such as the Office of Community and Intergovernmental Relations, the state of Maryland, and other organizations outside of government to develop curricula and teaching materials that focus on the beneficial values of wetlands. In addition, Wetlands Protection has produced outreach materials that discuss the ability of wetlands adjacent to waterbodies to improve water quality. For example, *Livestock Grazing on Western Riparian Areas*, produced in a cooperative effort with the Nonpoint Source Branch and Region VIII, provides technical guidance for developing grazing strategies to restore and protect riparian areas. (Nonpoint source pollution resulting from livestock grazing practices poses a significant threat to the water quality functions of riparian areas). *Beyond the Estuary: The Importance of Upstream Wetlands to Estuarine Processes* focuses on the beneficial effects that upstream wetlands have on the downstream water quality in estuaries.

- **National Guidance on Water Quality Standards for Wetlands:** This guidance was jointly developed by Criteria and Standards and Wetlands Protection to provide program guidance to states on how to ensure effective application of water quality standards to wetlands. Water quality standards for wetlands are necessary to ensure that the provisions of the Clean Water Act applied to other surface waters are also applied to wetlands. The development of standards provides the foundation for a broad range of water quality management activities including, but not lim-

ited to, monitoring under section 305(b), permitting under sections 402 and 404, water quality certification under section 401, and the control of nonpoint source pollution under section 319.

- **Criteria to Address Nonpoint Source Pollutants.** Wetlands Protection will provide support for the development of criteria to address the many types of nonpoint source pollutants including nutrients, clean sediment, and organic contaminants (e.g., pesticides). Wetlands Protection efforts will be focused on assisting in the development of biological and wildlife criteria applicable to all waterbody types and those specifically related to wetlands.
- **National Guidance on Wetlands and Nonpoint Source Control Programs:** The objective of this guidance, developed jointly by Wetlands Protection and the Nonpoint Source Branch, is to encourage coordination of the nonpoint source and wetland programs, both within EPA and the states. The guidance describes opportunities that exist for the transfer of data and other information between the two programs to support the programs' shared water quality goals. State nonpoint source programs can be directed toward preventing runoff to valuable wetlands. Wetlands programs can provide data and information on wetlands to state nonpoint source programs and use information generated from nonpoint source assessments to protect and restore wetlands through regulatory and nonregulatory actions.

Water Enforcement and Permits Programs

The Clean Water Act requires that point source discharges of pollutants to waters of the United States are unlawful unless the discharge is authorized by a National Pollutant Discharge Elimination System's (NPDES) permit. NPDES permits are issued by 39 states with authorized NPDES programs and in states without authorized programs by EPA regional offices. The Water Enforcement and Permits Programs oversee the implementation of the NPDES program, and take the lead in developing the regulatory framework defining the scope of the program.

The term "point source," which defines the jurisdiction of the NPDES program, can be interpreted broadly to address components of many sources of pollution that have traditionally been characterized as nonpoint sources, including discharges associated with urban runoff, resource extraction, land disposal, construction, and concentrated animal feedlots. However, because of limited resources, efforts to control water pollution under the NPDES program have traditionally focused on controlling pollutants in discharges from publicly owned treatment works (POTWs) and industrial process wastewaters.

In addition to establishing a framework for developing nonpoint source programs under section 319 of the Clean Water Act, the Water Quality Act of 1987 added section 402(p) to ensure that the NPDES program adequately addressed storm water discharges. (EPA is also addressing discharges from combined sewer overflows (CSOs) in a more comprehensive manner.) Section 402(p) requires EPA to develop a phased approach to addressing storm water discharges under the NPDES program. Under the initial phases of the storm water program, the Agency is to begin to develop requirements for:

- storm water discharges associated with industrial activity,
- discharges from municipal separate storm sewer systems serving a population of 100,000 or more, and

- discharges which are designated by EPA or an NPDES-approved state as needing an NPDES permit because the discharge contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States.

The Clean Water Act also clarifies that permits for discharges from municipal storm sewers are to require municipalities to implement a control approach (that is in many ways similar to that taken in traditional nonpoint source control strategies) by requiring controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and systems, design and engineering methods, and such other provisions as the director determines appropriate for the control of such pollutants.

EPA or NPDES states cannot require a permit for storm water discharges not addressed in the initial phase of priorities until October 1, 1992. (Agricultural storm water discharges are excluded from the Clean Water Act definition of point source and cannot be addressed under the NPDES program even after 1992.) Prior to that time, EPA, in consultation with the states, is required to conduct two studies on storm water discharges. The first study will identify those storm water discharges or classes of storm water discharges for which permits are not required prior to October 1, 1992, and determine, to the maximum extent practicable, the nature and extent of pollutants in such discharges. The second study is for the purpose of establishing procedures and methods to control storm water discharges to the extent necessary to mitigate impacts on water quality.

Based on the two studies, EPA is required to issue regulations no later than October 1, 1992, that designate additional storm water discharges to be regulated to protect water quality and establish a comprehensive program to regulate such designated sources. The program must, at a minimum, (1) establish priorities, (2) establish requirements for

state storm water management programs, and (3) establish expeditious deadlines. The program may include performance standards, guidelines, guidance, management practices, and treatment requirements, as appropriate.

Section 319 efforts to control storm water discharges potentially covered by the NPDES program should be coordinated with activities required under storm water discharge permits to ensure that all major sources of storm water runoff are addressed.

State programs under section 319 should focus on controlling urban runoff that will not be subject to storm water permitting requirements. For example, information/education and control efforts directed at preventing urban runoff (e.g., proper application of fertilizers and pesticides in urban settings, automobile oil changing and handling practices, and urban development controls) seem appropriate for assistance under section 319. Other activities include developing and implementing BMPs to control runoff prior to entry into storm water systems and developing and promulgating

state and local ordinances to control sediment and erosion. Furthermore, because section 402(p) does not apply to storm water impacts to ground-water resources, section 319 will be used to protect ground water from urban runoff.

Section 402(p) requires EPA to prepare two reports to Congress on storm water. The first, will identify sources of storm water and pollutants associated with discharges. The second will analyze means to address runoff from the those sources not subject to the initial permitting regulations. Experiences under the initial round of storm water permitting may suggest consideration of alternative means to address runoff from those cities or facilities not subject to regulation until after October 1992.

Information contained in section 319 assessments and their biennial updates conducted through the section 305(b) reporting process should indicate, to some extent, where the most serious municipal and industrial storm water runoff problems are located. Additional permitting efforts could be directed to those waters.

Municipal Pollution Control Programs

Municipal Pollution Control Programs manage efforts to assist communities in constructing new or upgraded municipal wastewater facilities necessary to achieve compliance with federal surface water discharge standards as well as protect public health and ground water. Traditionally, grants were awarded to communities through the wastewater construction grants program. More recently, Congress decided to substitute a loan program for the construction grants program.

This transition was initiated by the 1987 Clean Water Act Amendments. Title VI of the Amendments instituted the State Revolving Fund (SRF) program. Under the SRF program, EPA provides capitalization grants to the state to establish SRFs. The SRFs are designed and managed by the states with a minimum of federal regulation and oversight. SRFs are authorized to make loans, loan guarantees, and other "credit enhancements," but not grants.

EPA made significant progress in implementing the SRF program in FY 1989. In 1988, the first year of the program, eight states received capitalization grants. During the year, an additional 35 states established SRFs, bringing the total to 43. By the end of FY 1990, all states had received at least their initial capitalization grants.

Title VI gave states the flexibility to provide financing assistance not only to municipal wastewater facilities but also to "expanded uses," including activities such as nonpoint source management and ground water and estuarine protection. Such flexibility recognizes that states and local communities must address a variety of water pollution problems and have differing priorities for allocating scarce resources.

Most states have included provisions in their SRF enabling legislation and operating policies and procedures that authorized their SRF programs to provide assistance for not only municipal waste-

water treatment facilities but also state nonpoint source management programs (including provisions for ground-water control) and for the development and implementation of estuary Comprehensive Conservation and Management Plans (section 320). Because of pressing needs for municipal wastewater projects, however, most states do not contemplate providing SRF assistance for expanded uses within the next couple of years.

Several states are taking the lead in providing SRF assistance to expanded uses. The first activity likely to receive SRF assistance is a lake restoration project in Salisbury, Maryland. The Intended Use Plan for the state of Washington includes several expanded uses likely to receive funding during FY 1990 (e.g., urban runoff control). The Washington SRF specifically reserves 10 percent of its funds *each* for section 319 and 320 activities. The Intended Use Plan of the Delaware SRF includes numerous expanded uses. The state of Wyoming has largely met its municipal facilities needs and plans to use its SRF primarily to assist expanded uses, such as underground storage tanks. Other states in Region VIII may also emphasize SRF funding of expanded uses.

States are not required to provide SRF assistance for expanded uses. During FY 1989, the Office of Water issued guidance that explained the opportunities and procedures for funding expanded uses under various provisions of the Clean Water Act Amendments. During the year, the acting assistant administrator for water also sent a letter to each governor encouraging the states to consider using SRFs for funding expanded uses and for improving coordination among state water programs.

Efforts are also underway to improve coordination between the SRF program and other water programs within EPA. The Office of Water has encouraged closer coordination within the regional offices, including the possible establishment of interprogram task forces. During FY 1989, Muni-

pal Pollution Control Programs established the Expanded Uses Council, composed of the office directors of each of the Office of Water program offices. Further coordination and improved inter-program communication was provided at the staff level through an Expanded Uses Workgroup.

The SRF program requires assistance recipients to repay loans from a "dedicated repayment source." Many expanded uses do not have readily available revenue sources. As a result, some states and others have expressed concern about the feasibility of pro-

viding SRF assistance to expanded uses. However, communities may consider a wide variety of revenue sources to meet the SRF repayment requirements. Municipal Pollution Control Programs prepared a guidebook that discusses options for repayment of SRF assistance for expanded uses. The guidebook, *Funding of Expanded Uses Activities by State Revolving Fund Programs: Examples and Program Recommendations*, was distributed to the Regions and states in September 1990.

VI. Related Federal Programs

Although this Final Report to Congress focuses on EPA and state activities to implement the section 319 nonpoint source control program, the activities of other federal departments and agencies are critical to the success of national efforts to control nonpoint source pollution.

- Federal departments and agencies such as the Bureau of Land Management, the Forest Service, and others own approximately one third of all lands in the United States. Land-disturbing activities on these properties can create nonpoint source pollution.
- A number of federal departments such as the Department of Agriculture provide a great deal of educational, technical, and financial assistance to landowners whose operations can cause nonpoint source pollution.
- Many federal agencies, such as the National Oceanic and Atmospheric Administration, administer or oversee regulatory programs that may control nonpoint sources.

The following section describes some of the growing number of federal programs being used to support EPA and state nonpoint source control efforts. These descriptions do not discuss the full range of federal programs but provide an overview of the types of programs that are available to control nonpoint sources.

Tennessee Valley Authority

The Tennessee Valley Authority (TVA) carries out its statutory authority related to land management, administration of land rights, and permitting jurisdiction under section 26a of the TVA Act so as to protect or enhance the quality of the environment on its reservoir properties. In conducting its own operations and construction activities, TVA ensures the use of BMPs to control nonpoint source pollution.

In compliance with section 401(a) of the Clean Water Act, TVA requires that applicants proposing activities that may result in discharges into navigable waters provide state certification that they will comply with applicable provisions of the Clean Water Act. In addition, TVA requires that any permit approval, contract, license, or other authorization of any activity required by TVA that will disturb the land contain the following condition:

The applicant will conduct all land-disturbing activities in accordance with best management practices as defined by section 208 of the Clean Water Act and implement these practices to control erosion and sedimentation so as to prevent adverse water quality and related aquatic impacts. Such practices shall be consistent with sound engineering and construction principles; applicable federal, state, and local statutes, regulations, or ordinances; and proven techniques for controlling erosion and sedimentation.

TVA has established erosion control measures that help to mitigate nonpoint source pollution on the agency's lands (over 20,000 acres). Control measures include no-till cropping, crop rotation, contour plowing, terracing, winter cover crops, and uncultivated buffer strips along TVA reservoirs and streams. Only land that is not highly erodible and is not hydric is licensed for row crop use. Best management plans for cropland and grassland are reviewed by Soil Conservation Service personnel.

TVA is a major participant in the Land and Water 201 project. TVA uses low-altitude, color-in-

frared aerial photography to assess nonpoint source pollution in several watersheds in the seven-state region. This includes low altitude aerial inventories of the Chatuge Reservoir (North Carolina-Georgia), Little Tennessee River (North Carolina-Georgia), and Oostanaula Creek (Tennessee) watersheds.

Demonstration Projects

The Land Between the Lakes is TVA's 170,000-acre recreation, environmental education, and natural resource management demonstration area in western Kentucky and Tennessee. Activities there include the establishment of cover crops on row-cropped lands and BMPs for harvested forestlands.

Demonstration projects also include the Copper Basin in Tennessee where TVA has cooperated with industry to reclaim land denuded by copper smelting in the 1850s. Soil erosion from this 50-square mile area pollutes receiving waters in Tennessee and Georgia, increasing TVA hydroelectric production costs and causing flood storage losses in TVA's three Ocoee reservoirs. Early revegetation research and application were conducted by TVA and others beginning in the 1930s. Over the years, about two-thirds of the acres have been planted. In 1984, TVA began new practical demonstrations with Tennessee Chemical Company and others that have restored 1,855 acres (300 acres in FY 1989). About 10,700 acres remain in need of revegetation. Tennessee Chemical Company was selected by the National Wildlife Federation as winner of the 1988 Corporate Conservation Council's Environmental Achievement Award for this effort.

As part of the South Fork Holston River Basin rehabilitation plan, TVA is alleviating nonpoint source water pollution impacts in Virginia and Tennessee by reclaiming abandoned manganese mines. This mining, which occurred prior to state non-coal mineral mining and reclamation laws, has contributed to water quality problems. TVA has assumed a lead role in addressing the land stabilization activities needed to improve water quality in the system. Through cooperative efforts with the U.S. Forest

Service and private landowners, 276 acres in Virginia and Tennessee have been treated since FY 1985. In FY 1989, 10,000 tree and shrub seedlings were planted as part of remedial work, along with touch-up aerial fertilization of selected sites.

TVA also has worked closely with USDA agencies, local soil and water conservation districts, and landowners to install agricultural BMPs to specifically improve off-site water quality in the Middle Fork Holston River (Virginia) and Bear Creek Floatway (Alabama) watersheds.

Other Activities

To reduce nonpoint source pollution from crop production, TVA conducts fertilizer research and development at its national laboratory at Muscle Shoals, Alabama, and works with the land grant universities and USDA. Among environmentally significant current or planned projects are:

- development of BMP technologies such as controlled release fertilizers and approved fertilizer application equipment,
- refinement and evaluation of soil tests for more efficient nitrogen use,
- coordination of regional, unified approach, and targeted research,
- whole-farm demonstrations of methods to reduce nonpoint source contamination of waters, and
- construction of a wetlands research facility to study and demonstrate treatment of wastewater from the fertilizer industry using constructed wetlands technology.

Other TVA activities include participation in several interstate and local water quality committees to address water resource and nonpoint source issues involving watersheds of the Clinch and Powell Rivers (Virginia and Tennessee), Middle Fork Holston River (Virginia), Sand Mountain (Alabama), Bear Creek Floatway (Alabama), Oostanula Creek (Tennessee), and Nolichucky River (Tennessee).

At the request of the U.S. Army Corps of Engineers, TVA has conducted aerial nonpoint source inventories for Beaver Creek (Arkansas), East Sydney Lake (New York), and Puncoteague and Assawoman Creek watershed (Virginia). TVA also conducted a workshop for the Idaho Environmental Health Association on TVA's use of remote sensing to detect failing septic systems.

TVA is involved in several other activities related to water quality, including:

- Reclamation of the Double Top abandoned coal mine in Fentress County, Tennessee.
- Farm waste management demonstration projects.
- An innovative technology farm demonstration program that also includes methods to manage animal wastes.
- Resource management conservation demonstration farms that illustrate to farmers how soil erosion can be reduced to acceptable levels without adversely affecting net farm income. An evaluation of resource management conservation farms in west Tennessee shows that soil erosion on croplands was reduced by 65 percent by using conservation practices such as no-till, terraces, grass waterways, and silt basins. Annual top soil losses on some fields have been reduced from 15 to 20 tons per acre to tolerance (less than 5 tons per acre).
- A new program of soliciting and funding competitive cost-share proposals related to agriculture, which includes several nonpoint source control projects. Proposals funded included two for reducing the nonpoint source pollution caused by applying too much poultry litter on cropland. The litter will be processed and marketed over a wide area as a soil amendment, organic fertilizer, and cattle feed. Another project will involve irrigating from a lagoon to better manage hog wastes, and still another will compost dead chickens instead of burying them in a ground-water-polluting pit.

Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture

The U.S. Department of Agriculture's Agricultural Stabilization and Conservation Service (ASCS) administers farm commodity, conservation, environmental protection, and emergency programs.

Several ASCS programs contribute to reducing nonpoint sources pollution. For example, the

■ **Agricultural Conservation Program (ACP)** has several goals, including:

- conserving soil and water,
- improving water quality,
- protecting and maintaining productive farm and ranch land, and
- preserving and developing wildlife habitat.

The ACP cost shares with farmers and ranchers to install environmental protection practices that result in long-term public benefits. The FY 1991 appropriation for the ACP was \$190.150 million.

■ **The Conservation Reserve Program (CRP)** is designed primarily to protect the nation's most erodible and fragile croplands (see discussion under SCS). The 1985 Food Security Act included authorization for the CRP. It reimburses farmers for retiring highly erodible and environmentally sensitive croplands from production under 10-year contracts. Water quality improves because fewer pesticides, herbicides, and fertilizers are used and less erosion significantly decreases the annual sediment load reaching water courses.

Pesticide and herbicide use have declined by an estimated 1.5 pounds per acre annually (51 million pounds per year), and fertilizer use has diminished by an estimated 1,224 thousand pounds per year on the 34 million acres

enrolled. Erosion reduction saves 655 million tons of soil per year or 19.2 tons per acre per year. The CRP expanded program criteria to include environmentally sensitive lands such as filter strips, wetlands, and flood-prone scour areas.

USDA agencies and the U.S. Fish and Wildlife Service cooperated to publish and distribute a pamphlet, *Bottomland Timber Establishment on Wetlands*. The SCS has funded several university studies of CRP-related activities addressing the effects of filter strips, water quality runoff, and other pertinent subjects. The FY 1991 appropriation for the CRP was \$1.815 billion.

■ **The Rural Clean Water Program (RCWP)** provides financial and technical assistance to agricultural landowners and operators to test policies and procedures for controlling agricultural nonpoint source pollution in 21 project areas. To aid in the development of best management practices (BMPs), ASCS plans to use the RCWP water quality data to evaluate BMPs.

■ **The Colorado River Salinity Control Program (CRSC)** provides financial assistance to:

- identify salt source areas in the Colorado River Basin,
- install conservation practices to reduce salinity levels,
- carry out research, education, and demonstration projects, and
- carry out monitoring and evaluation activities.

The FY 1991 appropriation for the CRSC program was \$14.783 million.



Strip cropping to prevent soil erosion, and pesticide and nutrient runoff.

■ **The Water Bank Program** is designed to preserve, restore, and improve the wetlands of the nation and thus to:

- conserve surface waters,
- preserve and improve habitat for migratory waterfowl and other wildlife resources,
- reduce runoff and soil and wind erosion,
- contribute to flood control,
- contribute to improved subsurface quality and reduce stream sedimentation,
- contribute to improved subsurface moisture,
- reduce acres of new land coming into production and retire lands now in agricultural production,
- enhance the natural beauty of the landscape, and
- promote comprehensive and total water management planning.

The FY 1991 appropriation for the Water Bank Program was \$13.62 million.

■ **Under the Forestry Incentives Program (FIP)**, funds are used to develop, manage, and

protect eligible forest land. Emphasis is on producing softwood timber and enhancing other forest resources such as clean water, wildlife habitat, and recreational resources. FIP practices contribute to conservation objectives by protecting land from wind and water erosion, conserving water, reducing upstream flood damage, and improving water quality. The FY 1991 appropriation for FIP was \$12.446 million.

■ **The Emergency Conservation Program (ECP)** provides assistance to farm and ranch owners to restore land damaged as a result of natural disasters. In restoring such areas, the ECP helps to assure that conservation and pollution abatement measures continue to help reduce and, if possible, stop pollution of the nation's waters. The FY 1991 appropriation for the ECP was \$10 million.

ASCS plans to place additional emphasis on nonpoint source pollution by encouraging conservation review groups at all levels to:

- identify and rank known nonpoint source problem areas,
- develop cost-effective special practices necessary to solve the identified nonpoint source water quality problems, and
- propose selected water quality projects for special funding.

Soil Conservation Service, U.S. Department of Agriculture

President's Water Quality Initiative

Water quantity affects water quality in terms of how quickly and in what concentrations pollutants enter streams, lakes, and aquifers. Water quality obviously affects the quantity of water available for human consumption, agriculture, and other uses (especially in areas with sole-source aquifers or in regions short of water).

SCS' goal is to provide the best available program information and technology to rural and urban decisionmakers so they may respond effectively to farm water quality concerns and state environmental requirements. The SCS operations plan identifies five action elements:

- demonstration projects,
- technical assistance in nonpoint source hydrologic unit areas,
- regional projects,
- technology development, and
- database development.

Demonstration Projects

SCS and USDA Extension Service provide joint leadership for demonstration projects that will be completed over a three-year period. The objective is to demonstrate the effectiveness of selected conservation practices in treating specific nonpoint source pollution problems and to promote the use of these practices in other areas. Each project represents different sets of agricultural, soil, and geologic conditions, and each is located in an area where agriculture's effects on water resources are a major concern.

Nonpoint Source Hydrologic Unit Areas

In selected agricultural watersheds or aquifer-recharge areas called "nonpoint source hydrologic

unit areas," SCS, Extension Service, and cooperating agencies will provide conservation planning and technology assistance. This assistance helps farmers and ranchers meet state water quality goals without undue economic hardship. Hydrologic unit planning and treatment will be a coordinated effort by federal, state, and local agencies and will include public involvement. Projects will be selected on the basis of:

- significance of the agricultural sources of pollution,
- relative predominance of designated pollutants such as pesticides, nutrients, and animal wastes, and
- conformance with other water quality efforts.

SCS will evaluate each project to determine the effectiveness of the selected conservation practices. Findings on water quality effects will provide a basis for expanding application to other districts with similar water quality problems.

Regional Projects

SCS will accelerate ongoing technical assistance to multi-state regional projects that include water quality treatment objectives. Examples are the Gulf of Mexico Program, Chesapeake Bay Program, Great Lakes National Program, Land and Water 201, and the National Estuary Program. This assistance will further the development of nonpoint source pollution management plans to meet project water quality objectives.

Technology Development and Transfer

Updating the field office technical guide with the best available technical information is an essential part of SCS technology development. SCS will de-

velop progress assessment procedures to evaluate the effects of agricultural activities on water quality and quantity and formulate conservation systems to improve water quality. SCS plans to link assessment procedures to concurrent economic evaluations and expand the technology for determining sources of pollutants in watersheds and aquifer-recharge areas.

Elements of technology transfer include:

- expansion of field office technical guides, field trials, conservation experience, and cooperation with other agencies, with the support of area and state staffs,
- National Technical Center support to state staffs, and
- establishment of a National Headquarters Water Quality Technical Advisory Board to provide guidance and set priorities for national technology development.

Database Development

Database and software development to integrate National Resources Inventory information, agrichemical data, and soil surveys are essential for an analysis of farm program policy. Specific database efforts will include:

- soils-pesticides interaction characteristics,
- national Resource Inventory data,
- national climatological data,
- soil survey database for modeling, and
- plant materials database.

Increased Technical Assistance

SCS is participating in a number of ongoing joint programs (with USDA, U.S. Department of Interior, and EPA) that evaluate and remedy water quality programs from agricultural nonpoint sources. These programs help improve water quality with conservation and management practices for erosion, agricultural chemicals, animal waste, and irrigation water. Other joint programs address field runoff reduction, water table management, and water conservation. The farmer or rancher, assisted by a conservation planner, voluntarily develops conservation systems and then implements the combination of practices that best meets the conservation objective and complements the farm or ranch operation.

Information Dissemination

In 1990, SCS and Extension Service conducted a National Water Quality Conference, four Regional Water Quality Workshops, and an SCS/EPA Water Quality Program Workshop. The conference and workshops are part of the efforts to increase the SCS capability to solve water quality and quantity problems.

Additional outreach activities will include news releases, newsletters, technical notes and papers, videos, slide tapes, workshops, and field days. SCS will report progress quarterly.

The Forest Service, U.S. Department of Agriculture

The National Forest System

The Forest Service manages 191 million acres of public forests and rangeland for multiple-use purposes. These lands comprise the National Forest System.

In managing these lands so as to minimize impacts on water quality, the Forest Service has developed a nonpoint source management strategy. This strategy involves the design and implementation of preventive land management practices designed to protect beneficial uses, monitoring to determine effectiveness of design, and adjustment of practices as determined necessary. Best management practices (preventive land management practices) are used as project performance standards.

To help integrate this management strategy with land management programs, the Forest Service and the Bureau of Land Management are holding a series of joint training sessions for field personnel in the various states.

In Fiscal Year 1989, the Forest Service supported section 319 through a number of mechanisms:

- nine regional nonpoint source coordinators,
- three full-time technical forest water quality specialists who worked with 42 state foresters and water quality agencies,
- several technical workshops devoted to nonpoint source monitoring programs, and
- implementation of 145 national forest land and resource plans.

The Forest Service is working to develop agreements with the states that will provide for cooperative state/federal programs to control nonpoint sources for forests and rangeland. In many states, the Forest Service has been recognized as the designated lead agency for nonpoint source control.

In addition, cooperative programs are being developed to ensure that BMPs are developed according to the Forest Service Nonpoint Source Strategy to meet state water quality program requirements. The Forest Service has been active in assisting states to develop practices that can be applied statewide and a monitoring program that will help refine the BMP's design.

The Forest Service policy is to monitor the implementation of BMPs on all its projects where water quality may be at risk. The intent is to provide rapid feedback on the effectiveness of BMPs on a given project so that any water quality problems can be detected at their source and corrections made quickly where necessary.

Some examples of the specific activities underway in the Forest Service to improve water quality are:

- The watershed improvement program provides funding to rehabilitate lands and restore favorable conditions of flow. Revegetation, runoff control, and channel checks are among the measures used. In fiscal year 1990, projects were completed to improve 30,383 acres.
- The Knutson-Vandenburg Act allows some of the money received from the sale of timber to be used to restore and enhance the lands that were harvested. A significant amount of this funding is used to improve watershed conditions and water quality.
- The emergency burn rehabilitation program has spent an average of \$5 million dollars per year over the last three years to control runoff and sediment from lands severely burned by wildfires. These treatments have been highly successful in reducing immediate impacts of wildfire until ecosystems regain their handling capability.

- Healthy riparian areas are a key factor in maintaining water quality. The Forest Service has undertaken a national strategy to improve riparian areas damaged by chronic overuse.
- The USDA and Forest Service have provided increased emphasis and funding over the last three years to make our facilities comply with current environmental protection laws. A major emphasis has been abatement of known nonpoint pollution problems. In 1989, 203 projects were completed, costing in excess of \$3.5 million.
- The Lake Tahoe Basin Management Unit was set up and continues to work in controlling water pollution in the Lake Tahoe Basin. Sensitive lands that threaten the clarity of the water in Lake Tahoe have been acquired and are being rehabilitated and managed by the Forest Service. A cooperative effort involving other federal, state, and local agencies in California and Nevada, this is a major success story in water quality management.

State and Private Forestry

The Forest Service cooperated with the National Association of State Foresters and other organizations to publish and distribute a brochure on nonpoint source pollution control. The brochure encourages private landowners to seek assistance before undertaking an activity that may cause pollution.

Regionally and locally, the Forest Service continued to work with state forestry organizations in developing the input to 319 assessments and programs. The Southern Region in Atlanta took the lead in establishing a position to work with state foresters. Activities included assisting states in developing 319 assessments and programs, coordinating with the Dallas and Atlanta EPA regions on forestry issues, and distributing information on the economics of silvicultural BMPs.

Many state forestry organizations conduct surveys to determine compliance with BMPs. For example, Florida completed its fifth annual survey in 1989. A compliance rate of 94 percent was calculated from field checks on 128 operations. Florida has used survey results to identify areas that need additional technical assistance.

Nonpoint source control has been incorporated into the ongoing landowner training programs conducted in cooperation with agencies such as the Extension Service. For example, Virginia conducted 30 BMP training workshops between November 1988 and April 1989. Approximately 1,900 people were involved.

Foresters are available in most counties with a forest land base. Beginning with the 208 programs, they have included advice on BMPs in their recommendations to landowners. Maryland, with its focus on the Chesapeake Bay, has added 16 bay foresters to work in counties adjoining the bay. Pennsylvania foresters have established demonstrations on the use of forest buffers in mitigating the runoff from agriculture lands.

One goal of the Forest Service is to strengthen state programs. The Northern Region has provided financial assistance to state foresters in Idaho and Montana to help them establish water quality positions.

The State and Private Forestry branch of the Forest Service is also promoting a Forest Stewardship initiative to small non-industrial landowners who collectively own and manage 75 percent of the nation's forested land. This branch also supports efforts by state foresters to improve soil and water management of private forest lands.

Research

Significant work is being done at Caspar Creek in California in gaining an understanding of erosion processes and their relationship to timber harvesting. A major effort to understand the relationship between roads and harvesting on streams and fisheries is continuing at Boise, Idaho. Research projects in Moscow, Idaho, and Tempe, Arizona, are actively working to develop the water erosion prediction model for forested lands.

A new project at the Pacific Southwest Station will address cumulative effects of forest management. Projects in Kentucky are developing technology to reduce pollution from abandoned mines producing toxic acid.

Projects in the Pacific Northwest Station are addressing slope processes and the relationship to channel and fisheries impacts. Many other projects across the nation are focusing on aspects of forest management that influence water quality.

Fish and Wildlife Service, U.S. Department of Interior

During FY 1989, the Fish and Wildlife Service (FWS) focused attention on nonpoint source pollution problems in a number of areas. The service

- continued research to define the scope and effect of pollutants from urban and agricultural runoff, mining, silviculture, and hydromodification on fish and wildlife species and their habitats.
- conducted special information and education efforts to encourage farm owners to participate in the USDA Conservation Reserve Program (CRP), (planting schemes that establish cover for wildlife on CRP lands were emphasized in specially developed brochures), and
- worked with the University of Maryland Agricultural Extension Service to develop a pamphlet emphasizing the benefits of riparian vegetation in reducing nonpoint source pollution. The pamphlet, entitled *Streamside Forest: The Valuable Beneficial Resource*, is being distributed by the USDA Agricultural Extension Service.

Runoff from agricultural land, discharge of nutrients as a result of draining impoundments, and shoreline erosion were identified as problems on several wildlife refuges in the Chesapeake Basin. Suggested remedies include expanding vegetative buffer strips, reducing the amounts of pesticides and fertilizers used, using impoundments as sediment/nutrient traps, and stabilizing erodible shorelines.

Pursuant to section 7 of the Endangered Species Act, FWS provided a formal opinion for pesticide use on certain crops, forests, pasture, and rangelands to provide protection from runoff and/or drift of pesticides from agricultural lands. Specific measures were recommended to avoid endangering listed species.

FWS completed the draft Pest Management Policy to provide guidance in FWS adoption of pest management practices that have the least adverse impact on other organisms and the environment. When in final form, the policy will apply to pest management activities on FWS lands, in FWS projects, and to non-FWS personnel on FWS-owned or controlled lands and facilities.

In accordance with the Department of Interior's Irrigation Drainwater Program, FWS is determining the causes (and degree) of problems associated with excessive levels of micronutrients (e.g., selenium, boron) in irrigation wastewaters in arid western states. Controls and alternatives to help mitigate these problems are under development. Studies underway in a number of refuges are examining the potential for nonpoint source pollution from agriculture, mining, and oil and gas activities. New solutions are developed and implemented as specific problems are verified and their nature and extent ascertained.

FWS routinely provides recommendations on BMPs to control nonpoint source pollution when reviewing permit/license applications, federal project construction and operation plans, resource management plans, conservation easements, and other types of land management activities. Measures to mitigate damage to fish and wildlife resources or their habitats are included in these recommendations.

Bureau of Land Management, U.S. Department of Interior

The Bureau of Land Management (BLM) focuses its efforts on assisting states to identify affected bodies of water and develop nonpoint source management plans. The foundation for these efforts was provided by the Clean Water Act section 208 program.

The Bureau and the U.S. Forest Service jointly developed a training program for managers, planners, and natural resources staffs on the role and responsibility of each agency in nonpoint source pollution control. Guidelines for meeting the federal consistency requirements of section 319 and Executive Orders 12088 and 12372 were issued to all field offices. Field office programs were evaluated in FY 1990 as part of an overall evaluation of the effectiveness of nonpoint source management efforts.

Congress provided specific funding for the Bureau's Riparian Management Program. This program has had and will continue to have a significant effect on improving water quality on stream reaches under Bureau management and will remain one of the Bureau's highest priorities.

Specific State Activities

- **Arizona:** In an active riparian management program in Arizona, the Bureau has coordinated with the state and others to establish special designations to protect high value streams (including Cienega Creek, the San Pedro River, the Bill Williams River, and Bonita Creek).
Bureau personnel served as members of state subcommittees on rangeland and BMP development and anticipate participating on other pertinent subcommittees as they become active. A cooperative agreement between BLM and Arizona is being developed to implement the nonpoint source management program, and the Bureau will be named as the designated management agency for BLM-managed lands.
- **California:** Bureau personnel assisted in identifying streams affected by nonpoint source pollution and reviewed the nonpoint source management plan format and content. BLM anticipates signing a cooperative agreement similar to that between the state and the U.S. Forest Service and being appointed the designated management agency for BLM-managed lands.
- **Colorado:** The Bureau provided technical expertise, plan review, and commentary to work groups charged with designing and implementing a nonpoint source plan. BLM participated in the development of agricultural BMPs for the Grand Valley, in the inventory and monitoring of affected streams, and in the placement of erosion control structures.
- **Idaho:** The Bureau participated fully in the development of the state's nonpoint source management plan. BLM was the principal agency in the generation of grazing BMPs and participated in work groups for minerals, agriculture, and hydrologic modification. BLM districts implemented riparian management projects that include anti-degradation requirements and the state-designated BLM as the lead agency for BLM-managed lands. BLM updated the section 208 plan for agricultural development and is developing guidelines for implementation of agency-approved projects.
- **Montana:** The Bureau cooperated in the development of the state nonpoint source management plan and related BMPs. BLM is also participating in the implementation of BMPs for timber harvesting. These BMPs are mandatory on BLM lands, but the state program is voluntary.
- **Nevada:** Materials and information submitted by BLM will be incorporated in the state's non-

point source management plan. The state has not yet responded to offers for further participation by BLM.

- **New Mexico:** Bureau personnel participated with the state's Environmental Improvement Division to develop the nonpoint source management program, and BLM is the designated management agency for nonpoint source pollution on BLM-managed lands. Erosion control structures were placed on the Cruces River and the Rio Puerco (named as highest priority affected waterbodies by the state), and the BLM produced a watershed management plan that includes nonpoint source control measures. The plan will serve as a model for future efforts to address nonpoint source pollution issues.
- **Oregon:** The Bureau has long assisted this state in assessing waterbodies and developing and implementing nonpoint source control programs. Bureau personnel serve on EPA's technical advisory committee for Region X and helped produce the document, *Effectiveness of Agricultural and Silvicultural Nonpoint Source Control*. The Bureau participated in

the revision of the state's timber management practices program and is developing a Memorandum of Understanding with the state to name the Bureau as designated management agency for BLM-managed lands. The BLM also participates on the Governor's Watershed Enhancement Board and its technical advisory committee and provides technical advice to the Citizens' Advisory Committee for section 319.

- **Utah:** The Bureau participated on the Nonpoint Source Pollution Committee, the group charged with developing the nonpoint source management plan for Utah. The plan was recently forwarded to EPA for approval. The BLM anticipates designation as the management agency for BLM-managed lands.
- **Wyoming:** The Bureau participated in working groups for road construction, range, and forestry to develop the state's nonpoint source management plan and maintains an active interest in implementation of the plan. BLM anticipates approval as the designated management agency for BLM-managed lands.

Bureau of Reclamation, U.S. Department of the Interior

The Bureau of Reclamation operates under the authority of the 1902 Reclamation Act and Amendments and Executive Orders.

In 1987, Reclamation announced a redirection in its mission. Instead of concentrating primarily on water resource development, Reclamation is placing greater emphasis on more efficient operation of existing projects and resource management issues, such as water quality, environmental restoration, conjunctive use of surface water and ground-water, and hazardous waste management and cleanup. Among these are several initiatives that address nonpoint source pollution.

- **Irrigation Drainage Research:** At the Oakes Test Area in North Dakota, Reclamation is developing best management practices for irrigated agriculture. Under the guidance of a steering committee composed of representatives from the state, the U.S. Department of Agriculture, and the U.S. Environmental Protection Agency, Reclamation has developed a guidance manual that has been used by the state of North Dakota to develop its nonpoint source management program.
- **Technology Development:** Reclamation is working with the Tennessee Valley Authority and the University of Iowa to develop new technologies that will address water quality concerns associated with reservoir releases. An ongoing project involves self-venting turbine research to increase the dissolved oxygen content of hydropower releases in situations where releases do not meet water quality standards.
- **Cooperative Basin Water Quality Studies:** Reclamation is undertaking technical studies with other federal and state agencies to iden-

tify nonpoint source pollutants that are, or could be, causing water quality problems in Reclamation reservoirs. Cooperative studies are being pursued with the U.S. Environmental Protection Agency, the Bureau of Mines, and the state of Colorado on the Dolores and Arkansas rivers, which suffer from toxic metals contamination from abandoned mine lands. The projects are located in Colorado.

- **National Irrigation Water Quality Program (Department Irrigation Drainage Program):** The program is administered by a departmental program manager in the Office of the Secretary (assistant secretary for water and science) and is a cooperative effort between Reclamation, U.S. Geological Survey, U.S. Fish and Wildlife Service, the Bureau of Indian Affairs, National Park Service, and the Bureau of Land Management.

The objectives of the program are to identify areas that are being adversely affected by toxic elements in the irrigation return flows (drainage). The program has been divided into five phases. The U.S. Geological Survey is the lead agency in the first three phases. Reclamation is the lead agency in Phases IV and V.

Since 1986, over 600 sites have been reviewed. The sites relate to areas where Reclamation has developed federally funded irrigation that could affect a national wildlife refuge, state wildlife management areas, and/or threatened fish or waterfowl. The site review was conducted as part of Phase I studies in which areas were evaluated based on personal knowledge of the soils, water quality, and wildlife conditions. For projects that could not be readily deleted or were included in further phases, an audit report was prepared from agency files to help make that decision.

If Phase I determined a potential for problems, a reconnaissance study (Phase II) was conducted. Water quality, bottom sediment, and biota data were collected to determine if adverse impacts were occurring or likely to occur. If Phase II reconnaissance data were positive, Phase III began.

Phase III work determines what problems are occurring and identifies toxic elements, their location, and the mechanisms making them available to the injured fish and wildlife. A detailed report is generated for remediation work in Phases IV and V, if necessary.

In Phase IV, Reclamation would plan remediation. Reclamation's regional offices will coordinate this planning with the U.S. Fish and Wildlife Service, state fish and game agencies, state water quality control agencies, local governments, irrigation districts, and landowners. When the plan of action is developed and agreement is reached, the project remediation work (Phase V) would be initiated.

Commencing in 1991, four areas now under detailed Phase III investigations (Stillwater Wildlife Management Area, Nevada; Salton Sea Area, California; Kendrick Project Area, Wyoming; and Middle Green River Area, Utah) will move into the planning and project remediation phases.

Reclamation will be the lead agency in planning, engineering, and remedial activities. Irrigation water management to reduce and consequently retain flows is the principal remedial action that could be applied to control nonpoint source drainage problems. This may involve both delivery system and on-farm improvements, water table management to minimize contact with leachable pollutants, interception of drainage water immediately below the root zone to minimize contamination, retirement of the land, and possible collection and treatment of the drainage. Each area's remedial action will be based on impacts, toxic elements, and environmental harm. The final remediation will be based on site-specific conditions and will likely include a combination of treatments to represent best management practices.

Individual projects are usually addressed in Reclamation's regional offices, which work directly with the local sponsors of the irrigation project. They also interface directly with the state water quality agency's nonpoint source coordinator. In addition, Reclamation's staff is working with the states in preparing nonpoint source assessment reports and management plans to determine how to address other nonpoint source issues at Reclamation projects. This may also include representation on specific state nonpoint source committees.

Colorado River Basin Salinity Control Program

The Colorado River Basin Salinity Control program affects all seven basin states—Colorado, Wyoming, Utah, New Mexico, Nevada, Arizona, and California. Salinity standards for the Colorado River were developed by the Colorado River Salinity Control Forum in its 1975 report. Each of the basin states has adopted the 1975 report as its standard for salinity, and the U.S. Environmental Protection Agency has approved these state salinity standards: total dissolved solids (TDS) are 723 mg/L below Hoover Dam, 747 mg/L below Parker Dam, and 879 mg/L at Imperial Dam.

As the Colorado River flows downstream, the salinity concentrations progressively increase as a result of water diversion, evaporation from reservoirs, and salt contributions from both human-induced and natural sources. About half of the present salinity concentration in the Colorado River at Hoover Dam is human-induced, with about 37 percent attributable to irrigated agriculture. In June 1974, Congress enacted the Colorado River Basin Salinity Control Act, P.L. 93-320, with the Secretary of the Interior to proceed with a program to enhance and protect the quality of water available in the Colorado River for use in the United States and the Republic of Mexico. Reclamation is working with the seven basin states, the Colorado River Salinity Control Advisory Council, the Colorado River Salinity Control Forum, and several federal agencies to achieve the water quality standards for the Colorado River.

Costs associated with the salinity program (both Reclamation and the U.S. Department of Agriculture's portions) are cost shared by the basin states. Reclamation's program consists of constructing and planning specific projects to deal with nonpoint sources of salinity pollution. These activities include canal and lateral lining, improved drainage, other delivery system improvements, and control of nonpoint source saline inflow such as mineral springs and seeps. Reclamation's current program consists of four construction projects and two investigations that could lead to additional construction. Three of the construction projects involve lining existing canals and the fourth project involves intercepting saline water and deep well injection of the brine.

The U.S. Department of Agriculture, one of the participating federal agencies, is cooperating with Reclamation to reduce salt loading to the Colorado River. USDA's program is presently being implemented in the Grand Valley, Lower Gunnison, and McElmo Creek in Colorado; the Big Sandy River

area in Wyoming; and the Uinta Basin in Utah. In these areas, USDA is providing technical and cost-sharing assistance to farmers for the application of salinity reduction practices.

USDA's program focuses on reducing salt loading from on-farm irrigation and the associated irrigation water distribution systems. This is accomplished by improving surface irrigation systems or by

converting to sprinklers to reduce on-farm irrigation drainage. The reduction of seepage from lateral canals is accomplished by ditch lining or installation of buried pipelines. In addition, farmers are using a higher level of on-farm irrigation water management by controlling the timing and amount of irrigation water applied to meet crop needs.

National Oceanic and Atmospheric Administration, U.S. Department of Commerce

The Coastal Zone Management Act of 1972 encourages coastal and Great Lake states to develop and implement management programs to achieve wise use of land and water resources in the coastal zone and authorizes NOAA to issue grants for state coastal management programs. Although at the time this report was written, the Coastal Zone Management Act did not yet specifically address nonpoint source pollution, many states have begun to implement nonpoint source controls in their coastal zones. The following are land and water use programs to control nonpoint source pollution under several state Coastal Zone Management programs.

- **New Jersey's Coastal Management Program** reviews coastal construction permit applications to ensure that coastal waters will be protected from development runoff. Permits may be issued by local governments to require that the best available technology is used to treat or prevent runoff. Required techniques include providing water retention basins on construction sites and maintaining permeable surfaces.
- **Rhode Island's Coastal Resources Management Council** requires a minimum 50-foot development setback from coastal waters (except in the case of water-dependent uses). In many cases, the Council requires that the 50-foot buffers be kept in natural vegetation rather than in lawns or gardens, which could increase fertilizer and pesticide runoff.
- **Massachusetts Areas of Critical Environmental Concern Program** includes a number of coastal rivers and estuaries and protects over 145 miles of shoreline. Proposed development projects in these areas are subject to intense state review. For example, every

application for construction of a dock or pier located in these areas is reviewed for potential nonpoint source pollution impacts.

- **South Carolina's Coastal Council** has taken a number of steps to address water quality problems. The Council has funded studies on the effectiveness of commonly used storm water management techniques and developed storm water management regulations and a model storm water ordinance for local government use. The Council has also developed two manuals to provide marina developers with technical guidelines for marina construction and operation. Construction of coastal marinas in the state cannot begin until the applicant prepares a Marina Operations and Maintenance Plan acceptable to the Council in consultation with the state's water quality agency and the U.S. Coast Guard.
- **North Carolina's Division of Coastal Management and Coastal Resources Commission** requires development permits in areas of environmental concern, including tidal wetlands, primary nurseries, shellfisheries, and pristine waters. Nine of the 20 coastal counties have developed storm water runoff policies as part of their Coastal Areas Management Act Land Use Plan. The Department of Health, Environment, and Natural Resources enforces storm water regulations to ensure that water quality standards are not violated and shellfish waters will not be adversely affected.

The state's Outstanding Resource Waters program includes several estuaries. Regulations have been developed to further protect water quality in these waters through the state's coastal management permit process.

- **Delaware's Coastal Management Program** has been instrumental in implementing the state's erosion and sedimentation control program and in developing a new statewide storm water management program.
- **Florida's Coastal Management Program** has played an important role in implementing the state's Surface Water Improvement and Management Act (SWIM). The act was designed to clean, restore, and protect Florida's water resources. Since the act's passage, the coastal program has provided \$1.8 million to support SWIM efforts, including development of SWIM plans by state Water Management districts. The plans must ensure provision of recreational opportunities and protection of habitat and drinking water sources.
- **Washington's Coastal Zone Management Program** funded the citizen-based Willapa Bay Water Quality Coordination Council to help reduce herbicide and pesticide pollution in the bay. In addition, seven counties and cities received Coastal Zone Management Act funding to develop or enhance local action plans to protect and/or restore water quality. The projects included a monitoring and pollution source identification program for an oyster harvesting area and a study of state efforts to address agricultural sources of nonpoint source pollution in a number of watersheds.
- **New York's Coastal Management Program** has addressed a number of nonpoint source pollution problems. The development of Local Waterfront Revitalization programs allows municipalities to refine state Coastal Zone Management program policies to meet local objectives. For example, municipalities can adopt site-specific water quality objectives and require BMPs as part of local land use regulations.

During 1989, the Coastal Zone Management program sponsored a series of workshops on surface water quality problems on Long Island. Other workshops discussed the problems and solutions associated with boater pollution, storm water runoff, and septic systems. The program is also funding a comparative assessment of two stream corridors, one urban and one rural, to determine how land use patterns and regulatory practices have affected water quality in Great South Bay watersheds.

Other NOAA Activities

Eutrophication Study

NOAA's Strategic Assessments Branch (SAB) identifies and assembles comprehensive information about environmental quality as it relates to estuarine and oceanic resources. These data are used for national and regional assessments and to develop practical strategies to balance conservation requirements and use demands.

SAB will conduct a nationwide assessment of 120 estuaries with dangerously high nutrient levels (eutrophic estuaries). Using a standard questionnaire survey, the assessment will characterize the type of estuarine problems (algal blooms, low dissolved oxygen, fishkills, etc.), how long they last, and the size of affected areas. The results will improve the understanding of the relationship between eutrophication status and nutrient inputs.

National Coastal Pollution Discharge Inventory (NCPDI)

The NCPDI is a database and framework for calculating estimated pollutant discharges. It concerns point, nonpoint, and upstream sources affecting estuarine, coastal, and oceanic waters of the contiguous United States (excluding the Great Lakes).

- **Database Updates:** SAB undertook a series of projects in FY 1989 to perfect the estimates for selected pollutant source categories in coastal areas of the Gulf of Mexico. The projects include:
 - expanding the study area to incorporate more inland areas with estuarine drainage basins,
 - updating the base year to 1987 (especially the inventory of point source dischargers),
 - assessing the impact of management practices on nonpoint source pollutant discharges, and
 - improving the methods used to estimate pollutant discharges from urban areas and upstream sources.

In addition, projects are underway to develop computer applications that allow users better access to the NCPDI databases. These data sets represent the best available information on pollutant discharges to coastal waters.

Agricultural Pesticides

NOAA released *Agricultural Pesticide Use in Estuarine Drainage Areas: A Preliminary Summary for Selected Pesticides* in January 1989, summarizing the use of 28 environmentally important pesticides on 71 crops in the 92 original National Estuarine Inventory drainage areas. The report presents data on agricultural pesticide use and "toxicity-normalized" pesticide use that can be employed to estimate the relative effects of specific pollutants on various estuarine systems.

SAB began work in FY 1989 to update this information. The database contains estimates of use for 35 important pesticides, relating to the base year 1987. SAB will expand the study area to include all coastal areas in the country. Information from this database is now being used to identify estuarine systems that are at greatest risk from pesticide residues in agricultural runoff.

Nutrients

A series of reports completed in FY 1989 examine the levels of nutrients in estuaries of the Northeast, Southeast, and Gulf Coast. Flushing dilution characteristics, rate of freshwater inflow, estuarine volume, and estimated nutrient loadings signify a potential for eutrophication-related problems. SAB developed the information to assist the U.S. Environmental Protection Agency identify systems at risk.

The reports contain a one-page summary of physical dimensions, pollution susceptibility indices, estimated loadings, predicted concentrations status, land use, and point and nonpoint sources of nitrogen and phosphorus for each estuary in the region. SAB interprets the information for each estuary and estimates the effect of minor changes in nutrient loadings.

U.S. Army Corps of Engineers

Nonpoint source pollution control efforts by the U.S. Army Corps of Engineers include those made by the agency in its own operating projects and support of state nonpoint source management programs.

Efforts within the agency's operating projects focus on sedimentation and water quality in flood control reservoirs and navigation channels. With EPA, the Corps established a network of information exchange to facilitate nonpoint source management efforts. These projects have benefited from increasing knowledge and cooperation with the nonpoint source program.

The Water Resources Development Act of 1986, section 1135, authorized the Corps to examine existing projects to identify improvements for the purpose of improving the environment. Nonpoint source

pollution control activities may be incorporated into such projects.

The Corps has reviewed state assessments and management programs for nonpoint source control to:

- plan future steps for federal projects,
- provide for technical coordination so that the best practicable control measures can be achieved, and
- facilitate the review of consistency between such projects and state nonpoint source management programs. The mechanism for checking consistency is based on the development of necessary checks for consistency with state Coastal Zone Management Plans.

EPA's Efforts to Coordinate Nonpoint Source Programs and Activities

Given the number of federal departments and agencies with roles to play in implementing a comprehensive nonpoint source program and the likelihood of substantially increased federal nonpoint source activity during the next few years, it will become increasingly difficult and yet crucially important to coordinate and integrate the disparate federal nonpoint source programs and activities. Section 319 provides a framework for integrating all of these federal activities into the state nonpoint source management programs. This in turn will allow integration of these activities into the comprehensive national framework for water pollution control established by Congress in the Clean Water Act. The central organizing principles are described in the following paragraphs.

Section 319 of the Clean Water Act establishes a national program to control nonpoint sources of water pollution, the pollution caused by a variety of land-altering activities that result in runoff of pollutants to waters of the United States. Leading sources of nonpoint source pollution include agriculture, silviculture, grazing, mining, water supply development, drainage, and numerous activities associated with urban development and growth.

Many federal and state agencies and programs play a role in addressing nonpoint sources of water pollution such as agriculture, silviculture, coastal zone management, grazing, and mining. The broad variety of nonpoint sources of pollution, as well as their relationship to point sources often located in the same watersheds, necessitates a coordinated and comprehensive approach that integrates water pollution protection activities at the federal, state, and local levels.

EPA and state water quality agencies implementing the Clean Water Act have traditionally provided the institutional framework for coordinating our nation's water quality activities. They have es-

tablished water quality criteria and standards, directed construction of sewage treatment plants, implemented the national point source and wetlands permit programs, and led monitoring and evaluation efforts to assess water quality trends and assure that control efforts improve water quality.

EPA also implements many other water pollution programs in which point and nonpoint source controls are integrated, including

- the Clean Lakes Program,
- the Great Lakes Program,
- the Chesapeake Bay Program,
- the National Estuary Program,
- the Wellhead Protection Program,
- the establishment of total maximum daily loads, wasteload allocations for point sources, and load allocations for nonpoint sources, and
- water quality inventories and lists.

These and other programs are discussed in more detail elsewhere in this report.

Recognizing the many nonpoint sources of pollution and their interrelation to other aspects of water pollution control, Congress assigned EPA the role of establishing and coordinating the national nonpoint source control program. Section 319 establishes a three-stage approach for states, with EPA oversight and assistance, to control nonpoint source pollution.

Section 319 provides a mechanism for federal agencies to assure that their nonpoint source control activities are targeted toward identified water quality problems and coordinated with other point and nonpoint source control programs. States' section 319 management programs provide a means to establish and implement a consistent set of activities

within each state to achieve state-established water quality objectives. Working with state nonpoint source control agencies, with other state and local entities, and with each other, federal agencies can assure that nonpoint source control activities are integrated at all levels of government to assure that highest priority water pollution problems are identified and addressed in a coordinated fashion. EPA and the state water quality agencies can help assure, in turn, that these nonpoint source control activities are well integrated with other watershed protection measures such as point source controls, wetlands protection, and watershed modeling and monitoring.

VII. Other Organizations

Many public and private organizations have ongoing programs to address the problems of nonpoint source pollution. Some are directed at raising the level of public consciousness, others at implementing actual programs and practices.

A group of these organizations agreed to write position papers for this report. These presentations appear in this section.

These organizations include the Izaak Walton League, the North American Lake Management Society, the Northeastern Illinois Planning Commission, the National Association of Conservation Districts, Ohio EPA, the Conservation Technology Information Center, and the Chesapeake Bay Program.

The views expressed by the authors of each position paper should not be construed as reflecting the Administration's position. They belong to the authors alone. Readers should once again be mindful that these papers were written in 1989 and so some statements may be dated.

The Izaak Walton League of America

Karen Firehock, *Save Our Streams* Coordinator

The Izaak Walton League of America, formed in 1922, is one of America's oldest nonprofit conservation organizations. Today, the League has 50,000 members working together to protect and improve the nation's soil, air, woodlands, water resources, and wildlife.

The League

- promotes citizen involvement in local environmental protection efforts,
- educates the public about emerging resource threats,
- represents sportsmen's conservation concerns, and
- helps enforce natural resource protection laws.

Save Our Streams

For the past 20 years, the League has administered a nationwide river protection program called Save Our Streams (SOS) that involves thousands of people, including environmentalists, teachers, government officials, farmers, scientists, and private citizens. SOS provides help for those people who want to prevent the deterioration of our nation's waters by adopting a stream of their choice and becoming its active guardian.

SOS participants register their stream projects with the League's national office and are put on the League's national database of river protection programs. They receive regular issues of the SOS quarterly newsletter, *Splash*; updates on pending national legislation, conferences, and issues of concern; and an SOS kit that explains how to recognize pollution problems in a stream and monitor water quality using a biological approach and suggests corrective actions.

Recent additions to the kit have included nonpoint source pollution materials highlighting section 319 of the Clean Water Act and calling for citizen participation in their state's nonpoint source pro-

gram. A major feature on this same issue also appeared in the spring 1989 *Splash* newsletter, and the League's national office promoted citizen attendance at public reviews of section 319 management programs.

Biological Monitoring

SOS groups use biological monitoring to determine the health of their adopted stream. A simple technology that is both inexpensive and easily followed, biological monitoring involves determining the diversity and number of insects found in a stream. These two statistics are used in combination to estimate stream quality.

The League has conducted biological monitoring since the early 1970s and believes it provides a valuable method for citizens to gauge the quality of a local river. Biological monitoring gives an immediate indication of a river's health and provides an invaluable tool for states to assess the impacts of nonpoint source pollution. Citizen monitors assess trends in stream quality by observing changes in their sampling results over time. Monitors sampling in conjunction with a League chapter or other environmental group can send their monitoring data to a central location. For example, in Virginia and West Virginia, monitoring information is sent to the League's national office in Arlington, Virginia. The national office then uses the data to compile assays of river health. In cases where results seem unusual, participants are called to determine if the monitoring was performed correctly, if a problem was found, and if the proper authorities have been alerted.

Training

In the League's Virginia and West Virginia SOS programs, participants are trained in day-long biological monitoring workshops that teach them pollution identification, biological monitoring techniques, and ways to promote participation in state nonpoint source programs.

Helping States

Several states, because they cannot afford to monitor all state waters, have expressed increasing interest in using citizen monitoring data to assess the health of rivers. For example, the League makes its monitoring data available to Virginia's State Water Control Board for use in its section 305(b) report and to the State Department of Conservation for use in its section 319 nonpoint source program. In West Virginia, the State Department of Natural Resources will also use SOS data as part of its nonpoint source program.

Ohio uses data gathered in its citizen monitoring program to gauge the quality of its scenic rivers. Maryland, Kentucky, Georgia, Oklahoma, and other states are also planning to establish citizen monitoring programs to augment their statewide monitoring activities. The League assists and advises those states on setting up monitoring programs and provides free SOS kits and samples of kick-seines. Local League chapters also help set up networks.

Citizen Involvement: The Key to Successful Nonpoint Source Programs

Because section 319 of the 1987 Clean Water Act Amendments calls for voluntary participation and is not regulatory in nature, cooperation between state governments and private organizations offers vast benefits for both groups. In addition, working with citizen groups allows states to actively promote their programs. For example, the partnership formed between the League and Virginia allows more comprehensive river quality assessment by the state and participation of state scientists in the League's program; the League also becomes aware of and promotes state programs. Finally, the grassroots involvement in state water quality monitoring programs provides states with an environmentally aware citizenry supportive of state clean water goals and programs. Anyone wishing more information on the League's monitoring program can contact Karen Firehock, Izaak Walton League of America, 1401 Wilson Blvd., Level B, Arlington, Virginia 22209.

Northeastern Illinois Planning Commission

Gary C. Schaefer

Voluntary measures implemented by local government ordinances have long been the primary means for managing nonpoint source pollution. However, the establishment of voluntary local nonpoint source control programs has been hampered by:

- lack of understanding and/or appreciation of the potential uses of water resources and how nonpoint source pollution affects those uses,
- competition for funding between water quality programs and other government programs,
- lack of recognition of potential benefits because the nonpoint source management programs are so new,
- lack of development of enforcement policies where nonpoint source management controls have already been established,
- concern over ability to control pollution from older urban areas, and
- uncertainty about local enforcement authority.

Such concerns must be addressed if local communities are to become meaningfully involved in controlling nonpoint source pollution.

Successes and Failures

At present, there is no adequate measure of success for nonpoint source management programs. Lacking specific criteria to define achievement, few success stories are available to help promote public awareness and interest. Yet such interest is essential to the effective development and implementation of

nonpoint source management programs. Public awareness is growing and some management programs are taking shape, but progress is sluggish at best.

The lack of an adequate measure of success also prevents the recognition, understanding, or measure of failure. Monitoring programs are generally too gross and unscientifically focused to allow proper evaluation. Given these limitations, it is apparent that current approaches have not generated sufficient enthusiasm to cause local governments to voluntarily designate funds for nonpoint source control programs.

Local government authority to implement many nonpoint source control programs is poorly defined and, in some cases, lacking entirely. "Public health, safety, and welfare" is far from the explicit mandate needed to allow local communities to confidently implement management programs that may require private expenditures or confiscation of private property. Existing state and federal statutes generally reserve water quality protection authority for state and federal authorities.

Conclusions

The effort to control nonpoint source pollution at the local level would be enhanced by the following:

- The determination of scientific means for documenting sources and causes of water resource use impairments that is developed at the national level and at a scale meaningful to communities expected to implement management practices (i.e., small watersheds). The statewide assessments mandated by section 319 do not provide the scientific validity to draw conclusions about which management practices are needed and which would be cost beneficial.

- The development of a national policy for classifying streams on the basis of water resource assessments to be used in conjunction with local input on relative benefits of stream uses. It is important that such a policy recognize that sufficient resources are not available at any level of government to restore the lost uses of many waters.
- The development of blueprints for success that emphasize problem identification, selection of solutions to fit the problems, and demonstration of the protection or restoration of water resource uses. The section 314 Clean Lakes Program is a good starting point for finding examples of such an approach.
- Clarification of federal and state statutes and regulations to grant local governments the specific authority to address water quality.

The Northeastern Illinois Planning Commission examined the Illinois Environmental Protection Agency's "Nonpoint Source Assessment" ratings of northeastern Illinois stream quality versus watershed population density. Virtually all of the watersheds with existing population densities greater than 750 people per square mile were in the two worst of four categories. And nearly all watersheds with population densities less than 750 people per square mile were in the two best categories. This observation was not affected by the presence (or lack) of point sources. The very fact that the urbanization of a watershed has signaled the deterioration of its water quality indicates that present national policy requires greater focus on urban water resources.

North American Lake Management Society

The North American Lake Management Society (NALMS) is a national organization of citizens, scientists, lake associations, and water pollution control professionals concerned with the protection and restoration of water quality in our nation's lakes.

EPA's 1989 *Report to Congress: Water Quality of Our Nation's Lakes* shows that 76 percent of the pollution affecting lakes comes from nonpoint sources. Nutrients and siltation/turbidity were identified as being the most significant impairment factors.

Disturbing as this situation is, it can be changed. This optimism emanates from two factors. First is the increasing commitment of state and local governments and grass-roots groups to accept a partnership role with the federal government for nonpoint source control and lake management. Second is a greatly improved ability to organize, analyze, and interpret the effects of nonpoint source remediation measures that have emerged over the past 10 years.

The Growing Partnership

Ten years ago (when NALMS was born) there were only four state lake management organizations in the nation. Today, there are at least 15 such associations actively involved in managing their state lake resources. Of these, California, Florida, Michigan, Ohio, Oklahoma, Pennsylvania, Virginia, Washington, and Wisconsin are NALMS Chapters. Lake associations continue forming throughout the nation, providing evidence of grass-roots support and willingness to accept responsibility for managing "their" lakes.

These lake associations also are working closely with their states, encouraging the development of the new state lake and nonpoint source management programs, many of which are modeled on the partnership philosophy of the section 314 Clean Lakes Program. Local groups, cognizant of the "ownership" role all individuals share for nonpoint source pollution, are encouraging a similar working partnership in the new nonpoint source programs. These groups have supported innovative legislation and taxing mechanisms to fund nonpoint source pol-

lution control in such diverse states as Washington and Indiana.

Even though state and local governments and grass-roots organizations are accepting a responsible role in the management of the nation's lake resources, much remains to be accomplished to meet the goals of the Clean Water Act. Federal commitment to solving the nation's nonpoint source problems is imperative to meet these goals because nonpoint source problems more than any other type conform with reasons for enacting the Clean Water Act: the problems are national in scope and do not comply with state geographic boundaries. Lack of federal support confuses the issue and promotes a disjointed effort.

Continued federal support of demonstration grants under section 319 will move toward problem solutions in an orderly manner such that improved guidance can be issued as more is learned about the effects of nonpoint source remediations under varying conditions. Only through evaluation of their effectiveness can we address and resolve issues concerning nonpoint source pollution control measures.

Congress has made a commendable start toward restoring health to our nation's waters in the Clean Water Act. The message to the American people is indisputable: clean water is an important part of our quality of life and needs to be protected, restored, and maintained. Americans clearly want and deserve clean lakes and reservoirs for safe drinking water, recreation, industrial use, and aesthetic enjoyment. These waterbodies are vital ecologically to fish and wildlife; and economically, to our communities. Ninety-nine percent of the nation's population lives within 50 miles of a publicly owned lake; more than half within five miles.

Yet we continue to abuse this important resource—and nonpoint source pollution is by far the greatest abuser. NALMS believes, however, that with the help of the Clean Water Act, we have made significant progress toward understanding lake and watershed processes. Institutional infrastructures begun at the state and local level will, when completed with federal support, restore the quality of our nation's lakes and reservoirs.

National Association of Conservation Districts (NACD)

Ernest Shea, *Executive Director*

As public awareness increases, so does public concern for surface and ground-water contamination. In recent years, communities have developed increasing appreciation of the impact water quality has on existing social and economic institutions.

While many sources of pollution corrupt our nation's waters, NACD and conservation district activities focus primarily on those from nonpoint sources related to agricultural activities. However, urban, mining, silvicultural, and other nonpoint sources are also addressed by conservation district programs.

State and Local Activities

Federal programs addressing agricultural nonpoint source problems have been slow to materialize, but state and local governments have been moving swiftly to develop nonpoint source programs.

By the time section 319 was enacted in 1987, 25 states had already established and funded technical assistance and cost-sharing programs to address nonpoint source pollution. These programs were aimed at helping land users apply best management practices to control agricultural nonpoint sources of pollution. In 1989 alone, state governments appropriated over \$120 million to fund these endeavors.

NACD Activities

In response to the needs of its members and others in the conservation community, NACD has been instrumental in bringing nonpoint source issues to the forefront of the public agenda. NACD has conducted a number of special projects since 1978 to assist program managers and policy makers in developing and carrying out nonpoint source water quality programs.

Most recently, in April 1989, NACD and the U.S. Environmental Protection Agency sponsored a national nonpoint source conference that brought together nearly 500 conferees from both the public and private sectors. The conference was one of the first national meetings to provide a dedicated forum to review policy decisions and discuss innovative program ideas in the nonpoint source arena. It also demonstrated very clearly that state and local governments, as well as the private sector, are already working vigorously to tackle nonpoint source pollution problems.

Nonpoint Source Program Needs

One essential component in building a national framework for solving nonpoint source problems is still missing: a strong commitment from the federal government to provide overall national leadership in pursuing America's clean water goals. Many conservationists hailed the inclusion of section 319 in the 1987 Clean Water Act Amendments as a signal that the federal government was at last going to provide much needed leadership in this arena. To their disappointment, however, progress has been painfully slow.

What is clearly needed is a message that Congress is ready to follow up its words with actions. The 1987 amendments authorized \$400 million to help states carry out their nonpoint source management programs. To date, only \$40 million has been appropriated specifically for section 319 — a figure far short of that needed.

Three specific elements must be in place to meet the challenge of the nation's nonpoint problems:

- state leadership in developing programs and standards that reflect individual state needs,

- local community involvement in the coordination of technical and financial assistance with local program requirements, and,
- financial support and overall program guidance from the federal government.

A coordinated effort on the part of federal, state, and local governments, private industry, landowners, and managers is needed to protect water supplies from agricultural nonpoint sources of pollution. Several federal agencies, including EPA and the U.S. Department of Agriculture, have been moving along these lines in the past two years.

NACD Recommendations

NACD recommends that EPA follow the lead of the states and develop a cooperative, nonregulatory approach for addressing agriculture-related water quality problems.

- Initiate major local level outreach efforts to educate farmers and ranchers on the ways agricultural practices cause water quality problems.
- Provide financial and technical assistance and other incentives to encourage land managers to adopt best management practices to protect their soil and water resources.
- Integrate nonpoint source control initiatives with ongoing erosion control and water quality programs to ensure that

comprehensive and balanced natural resource management programs are applied at the farm level. For greater effectiveness, current farm conservation BMPs need to address both nutrient and pesticide management along with other natural resource management issues.

The real key to success does not lie in a stronger federal regulatory framework. Success will be achieved in working cooperatively with farmers and ranchers, helping them adopt management practices that meet social, economic, and environmental protection goals. Incentive-based approaches most effectively persuade farmers to adopt new management techniques. Further, most states have the authority to deal with situations where individuals fail to respond to incentives. The necessary authority is also present to handle situations in which contamination poses an immediate threat to the public welfare or environmentally sensitive areas.

Congress enacted the section 319 nonpoint source program with a "five-year lease on life." If significant progress isn't made by 1992, what comes next? A burdensome regulatory program? NACD suggests that the section 319 program be given a fair chance to succeed. Give the program the opportunity to get off the ground and become operational before deciding its fate.

The three elements discussed here form the core of a workable strategy for addressing agricultural nonpoint source pollution, and the first two are already largely in place. Only when the third is present will our nation's water quality goals be within reach.

Conservation Technology Information Center

Lyn Kirschner, *Water Quality Specialist*

As concern over water quality continues to increase, the Conservation Technology Information Center (CTIC) continues to develop new products and methods to keep up with the information demand. Established in 1982 as a special project of the National Association of Conservation Districts (NACD), CTIC gathers and disseminates information on soil conservation, water conservation, and water quality as it pertains to cropland. In January 1989, a water quality specialist was added to the CTIC staff. Producing factual water quality information is one of the primary goals of the Center.

The Center's newsletter, *Conservation Impact* (circulation 28,000), includes a regular section dedicated to information about nonpoint source pollution. This section highlights programs, individuals, best management practices, and initiatives that are having an effect on the improvement of water quality.

CTIC also provides the more than 3,000 conservation districts with water quality information through its association with its parent organization, NACD.

CTIC publishes a National Directory of Nonpoint Source Agency Contacts annually as an insert to *Conservation Impact*, which includes: state water quality agency contacts, EPA nonpoint source regional coordinators, and USDA-SCS state water quality coordinators.

Another CTIC project is the fact sheet series. *Nitrogen Facts*, the first of the series, was released in the fall of 1988 (distribution: 15,000). *Pesticides Facts* was completed in the spring of 1989 and an initial run of 30,000 copies distributed. Topics for future fact sheets include a phosphorus and nitrogen budget.

Raising the public awareness of water quality matters is the ultimate goal of CTIC. Through water quality education, CTIC landowners and operators are able to make wise land use and management decisions to protect the environment as a whole.

Ohio Environmental Protection Agency

Chris O. Yoder

Chemical monitoring techniques have traditionally been used to assess the impacts of water pollution. Designed to protect water quality for aquatic life and human uses, these techniques are based on numerical criteria for chemicals. This chemical-based approach to pollution control has led to reduced point source loadings overall, particularly conventional pollutants. Further refinement of chemical criteria and the use of emerging bioassay techniques have also controlled toxic substances from point sources. As with any single tool, however, the chemical-based approach has important limitations.

The Problem

Traditional environmental assessments based upon chemical monitoring (e.g., biennial 305b reports) has revealed the need for holistic tools that measure an end result of environmental regulatory efforts (a U.S. Government Accounting Office review in 1986). While indicators such as the amount of money spent on treatment facilities or the number of point source discharge permits issued may give the impression of progress toward the goals of the Clean Water Act, neither actually measures environmental results. Chemical and toxicity evaluation tools can measure changes in water quality, but both indirectly measure biological integrity. Furthermore, nearly all environmental impacts are dynamic and often evade the steady-state assumptions inherent in these tools, thus limiting their accuracy.

In addition, biological integrity is not determined by water quality alone. It may include alteration of aquatic habitats, disruption of energy cycles, changes in watershed characteristics, and biotic interactions, all of which are frequently reported as nonpoint source impacts.

To explore the relationship between chemical and biological evaluation tools, Ohio EPA compared the chemical criteria and biocriteria for their ability to identify effects on aquatic life. These tools were in agreement 56 percent of the time, but biocriteria identified impairment in 36 percent of the cases where chemical criteria indicated no impairment.

While much of this discrepancy was due to non-chemical impacts, the inadequacy of chemical monitoring networks was also a major cause.

Thus, what is now a singular focus on water quality needs to be expanded to include the water resource as a whole if we are to truly attain the objectives of the Clean Water Act. Tools that can measure the end result of all types of degradation are needed to reach this goal.

Biocriteria

Attainment of the Clean Water Act's biological integrity goal can be measured holistically by direct evaluation of aquatic communities. Such ambient biological evaluation is re-emerging, as evidenced in both the technical literature and the inclusion of biocriteria in U.S. EPA water programs.

Biocriteria resemble chemical criteria in that each has a narrative description of use accompanied by a numeric criterion that serves as a benchmark of use attainment. Biocriteria, however, measure the indigenous aquatic community directly, whereas chemical criteria are indirect, surrogate measures based largely on laboratory toxicity tests of selected aquatic species that are then extrapolated to represent the indigenous aquatic community as a whole. Biocriteria also include representative ecologically relevant characteristics.

An operational definition of biological integrity is "the biological performance of the natural habitats of a region." This means that the aquatic community performance goal is established by measuring the aquatic community at selected reference sites that exhibit the typical, least affected habitats within a relatively homogenous geographical area. Ohio used the regional reference site approach and Omernik's ecoregions, developed at EPA's Corvallis lab, as the basis for selecting least affected sites and organizing the biocriteria. Ecoregions also include geographic and watershed/land use components that ultimately determine the types of nonpoint source problems that are likely to arise within each.

In Ohio, both the fish and macroinvertebrate communities are measured using multiple metric type evaluations, including the Index of Biotic Integrity (IBI) and the Invertebrate Community Index (ICI). These indices use ecologically complex and relevant information and assemble it in a numerical evaluation. The IBI and ICI should not be confused with other biological measures such as diversity indices, which do not include the needed degree of ecological relevance or complexity.

Biocriteria are established by organism group, biological index, stream size, use classification, and ecoregion. These were recently adopted into Ohio's water quality standards regulations (February 1990) and serve as holistic benchmarks for evaluating aquatic life use attainment. It is important to recognize, however, that biocriteria are ambient arbiters and cannot be applied directly to an effluent pipe or similar conveyance.

Application

Biocriteria can be applied wherever aquatic life protection is a goal. Because the indigenous aquatic communities reside full-time in the aquatic environment, they integrate environmental effects over time. Thus, their condition reflects both past and recent events. This makes biocriteria specifically well suited to serve as an end point or results-oriented measure of the success of pollution controls.

Because of their variable, dynamic impacts, nonpoint sources uniquely challenge traditional chemical and toxicity assessment tools. While these tools will be useful, an integrative assessor such as

biocriteria is needed to accurately evaluate the results of nonpoint source management.

Conclusions

If nonpoint sources are to be managed successfully, then it is important to properly identify and characterize their environmental impacts. An integrated approach using the traditional chemical and toxicity tools along with direct assessment of the indigenous aquatic biota will be needed to ensure accuracy and completeness in both monitoring and assessment. Ohio EPA has used biological assessment extensively as a problem discovery and characterization tool. Twelve years of statewide monitoring show that environmental problems are much more likely to be detected and accurately characterized if ambient biological monitoring is included.

Furthermore, the traditional focus of water pollution programs on water quality alone must mature into a concern for water resources. The current emphasis on toxics in point source programs must be broadened to include non-toxic chemical and non-chemical impacts because impairments often result from non-toxic forms of degradation. For example, the principal causes of aquatic life impairment identified by Ohio in its 1988 305b report were organic enrichment (34 percent), habitat and sediment (23 percent), toxic substances (36 percent), and other (7 percent). More than half of the first category and all of the second were caused by nonpoint sources. It would seem appropriate to focus both monitoring/assessment and regulatory efforts accordingly.

Chesapeake Bay Program: Nutrient Reduction

Lynn Schuyler, *Chesapeake Bay Program / EPA Region III*

Reducing nonpoint source pollution has been a significant element of cleaning up Chesapeake Bay since EPA first identified nonpoint sources as a major cause of the bay's decline. The Chesapeake Bay Agreement of 1983 between the governors of Pennsylvania, Maryland, and Virginia, the mayor of the District of Columbia, and the Administrator of EPA pledged to restore and protect the bay and established the Chesapeake Executive Council to coordinate bay cleanup. EPA helps fund this effort, and provides technical and administrative assistance.

In December 1987, a new Chesapeake Bay Agreement set goals for cleanup and specific schedules for accomplishing plans to restore and protect the bay's fragile living resources. One of the most significant goals is the commitment to control nutrient enrichment:

The Agreement's goal was to develop, adopt, and begin implementation of a basinwide strategy to equitably achieve by the year 2000 at least a 40 percent reduction of nitrogen and phosphorus entering the mainstream of the Chesapeake Bay. The strategy was to be based on agreed upon 1985 point source loads and on nonpoint loads in an average rainfall year.

This Baywide Nutrient Reduction Strategy is now being implemented, and roughly half of the nutrient reductions are expected to be from nonpoint sources.

Tracking Nonpoint Source Nutrient Reduction

The Chesapeake Bay nonpoint source programs have been tracking agricultural nonpoint source progress since 1985 through a BMP tracking requirement in the implementation grants. This process was refined in the *Chesapeake Bay Nonpoint Source Programs* report, published in January 1988. Using 1985 as the base year, this document reported

nonpoint source control progress for 1985 and 1986 by tracking BMP installation and calculating the reduction in erosion and the amount of animal wastes stored.

Base year data were developed using information from the USDA National Resource Inventory for 1982 to ascertain the erosion from cropland needing treatment. These data were corrected to 1985 by removing the acres that had been treated under USDA and state programs in 1983 and 1984. Tons of manure were calculated from animal numbers obtained from Bureau of Census; Agricultural Census data were adjusted to obtain the tons that were storable. These two sources were considered potential nonpoint source loads; they are reduced by each BMP installed. No attempt has been made to transport these potential loads from the fields to the bay, since the reduction numbers for each BMP are at the field and can be subtracted directly from the potential source.

For tracking purposes, a BMP is not counted until it is certified as completed and the cost-share payment made. This ensures that only properly constructed, functioning BMPs are counted. The states supply, at a minimum, the following information for each BMP:

- location of the BMP by county and watershed,
- BMP type, using either the SCS practice code or a state practice code,
- acres benefited, total land area protected by the BMP,
- tons removed, the amount of soil that no longer erodes from the acres benefited,
- tons of animal waste stored,
- total cost of the BMP,
- cost-share funds paid for the BMP, and
- other cost-share funds.

USDA Agricultural Conservation Program BMP installation information is obtained annually and processed to compile tracking information for the bay portion of each state and county. These data are combined with the state Chesapeake Bay Program data and used to develop reduction percentages for animal waste controlled and tons of erosion reduced from highly erodible cropland.

Efforts are now underway to identify additional reductions that have been achieved without cost-share assistance. The states and SCS are setting up a system to transfer SCS progress reporting data to the states for inclusion in the tracking system.

When the states developed their nonpoint source portion of the Nutrient Reduction Strategy, each used different methods to estimate load reductions. They also used different nonpoint source components, thereby making it very difficult to calculate nonpoint source reductions without tracking information for each component. Therefore, it is difficult to relate the tracked agricultural progress with the progress each state projected in the strategy. However, by using nutrient values for a ton of soil and a ton of animal waste, the parameters can be added

together and related to the agricultural source loads used by each state. Since the parameters are sediment oriented, the system is more efficient in tracking phosphorus reduction than nitrogen reduction. As more nutrient management plans are implemented, the potential for reduction of soluble nutrients, such as nitrogen, will greatly increase.

The tracking of nonpoint source nutrient reduction will remain a very important activity for many years. The states and the District are initiating tracking systems for non-agricultural BMPs. Virginia is now tracking forestry operations and shoreline erosion and sampling 11 counties for pilot urban tracking. The District of Columbia is tracking urban BMPs, and Maryland is developing reporting systems for urban, forestry, and shoreline erosion.

Eventually, data from all BMP installations and point source treatment plant changes will be entered into the Chesapeake Bay watershed model and changes in water quality will be reflected in the model output. This will enable a jurisdiction to evaluate its entire reduction strategy on a real-time basis.

VIII. Selected Nonpoint Source Problems and Solutions

This section includes approaches to nonpoint source control that may or may not be addressed by formal programs. Livestock and grazing management and the concept of low input sustainable agriculture are approaches to alleviating the agricultural nonpoint source problem.

The problems associated with irrigated agriculture also are discussed in this section.

Composting and using compost are considered nonpoint source controls by EPA. Composting represents an additional method to manage livestock manures and dead poultry. Compost use incorporates the concepts of recycling and pollution prevention by returning organic matter and nutrients to the soil, reducing erosion, and reducing the need for chemical inputs.

Economic approaches to controlling nonpoint source pollution are being used at all governmental levels. Several examples of such market-based incentives are described here.

Nonpoint Source Water Quality Problems from Livestock: Animal Waste and Grazing Impacts

Improperly managed livestock operations can cause nonpoint source water pollution in at least two ways. Improper manure storage and utilization eventually can contaminate water, while livestock grazing can cause soil erosion that later results in water pollution. Either way, waterbodies and ground-water resources near livestock operations are endangered.

Animal Waste-related Impairments

Manure from livestock can impair both ground and surface water if it is not properly managed. By leaching into ground water or running off into surface water, animal manure can contaminate drinking water with nitrates and cause eutrophication of ponds, lakes, and estuaries. Excessive eutrophication and releases of ammonia from urine may have adverse effects on fish. In addition, bacteria from animal manure has resulted in the closure of shellfish beds.

Many manure-related impairments of surface and ground water originate from nonpoint sources. For example, in unconfined livestock operations, manure and sediment runoff can be significant, particularly where livestock are free to trample and defecate in and along streams and ponds. Runoff from animal loafing areas, such as those associated with dairy operations, can be damaging because daily trampling eliminates the vegetative cover that could take up manurial nutrients or hinder the movement of runoff to surface waters.

In addition, farmers may not properly store manure or may land-apply it at rates that exceed crop uptake resulting in excessive manure supplies. Moreover, farmers may apply manure to cropland at agronomic rates and still encourage water resource

degradation because the rate of nutrient release in manure is not synchronized with the rate of nutrient uptake in the crop.

These forms of nonpoint source pollution can be limited in several ways. To prevent stream and pond disturbance resulting from direct access of livestock to such waters, farmers could install electric high tensile wire fences along streams and provide environmentally sound stream crossings. Solar-powered tensile fencing is another promising option; the Pennsylvania Game Commission and ASCS are promoting the use of such fencing because wire mesh fences accumulate a great deal of debris.

Where livestock are not allowed to drink from surface water, alternative water sources such as watering troughs fed by ground water could be installed. EPA's Clean Lakes Program has successfully demonstrated that these water sources reduce animal trampling along streams and ponds, which in turn reduces manure and sediment runoff.

Another promising option is to rotate cattle among several smaller-sized loafing areas so that vegetative cover can regenerate. If proven effective, cattle rotation could significantly reduce sediment and manure movement to streams. Finally, farmers should provide adequate storage for manure supplies and apply only those manure nutrients needed by a crop. Additional research is necessary to assure that nutrient release from manure can be matched with crop uptake rates.

Management of runoff of manure and wastewater accumulated in many livestock operations is covered under the National Pollutant Discharge Elimination System (NPDES) program. The NPDES requires regulated farmers to build structures that store waste and wastewater from their livestock operations. The categories of livestock production requiring NPDES permits under current EPA regulations (40 FR 122.25) include:

1. Operations with more than 1,000 animal units (equivalent to 1,000 beef cattle) that discharge *indirectly* to U.S. waters,
2. Operations with more than 300 animal units that discharge *directly* through a conveyance to U.S. waters, or
3. Operations with fewer than 1,000 animal units that cause *significant* water quality impairment.

An operation not meeting these criteria is exempt from existing federal regulatory requirements and thus is regarded as a nonpoint source. Furthermore, all poultry operations with dry manure handling systems are not included. Therefore, most layer and broiler operations are exempt from these requirements.

According to the USDA Agricultural Statistics Board and the Census of Agriculture, between 5,000 and 10,000 livestock operations exceed the 1,000 animal unit criterion. However, initial EPA surveys indicate that NPDES authorities are experiencing implementation problems with interpreting EPA's existing feedlot regulations as well as issuing and enforcing permits for feedlots. EPA will continue to evaluate regulatory approaches to livestock waste control for the Stormwater Report to Congress under section 402(p)5.

In the meantime, however, NPDES authorities need to develop a strategic approach to reach the huge number of facilities that are subject to the existing NPDES program. One option would be for the NPDES authority to issue individual permits to only the largest confined operations, such as those in the concentrated beef or swine industry. General permits could cover the rest of the eligible concentrated operations.

In addition, the NPDES authority should be encouraged to work with the state nonpoint source authority to identify the watersheds and ground water with the most significant water quality problems caused by feedlots regardless of feedlot size. These authorities as well as organizations such as Save Our Streams can play a crucial role in identifying livestock operations that cause significant impairment, even though many of these operations are smaller than 1,000 animal units. Given this information, the NPDES authority can better establish permit program priorities. The nonpoint source authority can identify the operators who are not meeting the terms of their permit.

The nonpoint source authority also can help livestock operators find financial assistance (either through USDA, the Clean Lakes Program, the Chesapeake Bay Program, or various state programs). These programs are also used by farmers who wish

to voluntarily undertake control measures and whose operations do not fall under the NPDES program.

Although several programs share with farmers the costs of building waste storage facilities, some states lack the money to pay their share. In such states, farmers must shoulder the entire cost of building (which alone can exceed \$100,000), operating, and maintaining such structures. The high cost could force many less financially stable farmers out of business, which in turn could concentrate more livestock onto fewer farms. This factor, in addition to technical and biological advances in animal production and economic factors regarding the relative cost and availability of feed, are responsible for an overall trend toward larger, more highly concentrated livestock operations. Initial EPA surveys indicate that the combination of regulation and economic incentives (such as cheaper feedstuffs) are causing geographic shifts in livestock production from one state to another.

Such increases in concentration could result in site-specific imbalances in manure production that would mean major headaches for water quality managers. In fact, if all farmers were to plant all their harvested cropland acreage (minus that planted to legumes) to the most nitrogen-demanding crop, corn, and if they applied all recoverable sources of manure to maximize corn yield (equivalent to 240 lb. N/acre), 28 counties would still have excess manure supplies. Given that the average nitrogen application rate for corn is 140 lb. N/acre, the number of counties with excess nitrogen climbs to 62. These figures do not take into account farmer use of commercial fertilizer, which, if included, would greatly increase the number of counties with manure imbalances. In addition, these estimates average out local variation in field use and livestock production that would limit all farmers' ability to spread manure throughout the county; this implies that more counties have manure hot spots.

An initial survey of NPDES permits for feedlots indicates that, typically, permits do not address land application rates and practices. Ignoring land application rates, especially on farms with very limited land area, could ultimately result in serious groundwater contamination. The rapid growth in swine and poultry production along the Eastern Coastal Plain illustrate such an area of concern. Because the high moisture content of manure, particularly dairy waste, makes it very bulky and heavy, transporting large quantities to other farms or even to central processing facilities is difficult. A large-scale market for manure intended for energy uses or composting could make manure management easier; in addition, other approaches such as on-site drying or composting should be studied.

While the NPDES program can move manure into a controlled storage structure, no farmer is specifically required to undertake further BMPs when the manure is taken out of storage. Therefore, the farmer can encourage runoff of these wastes by applying them to cropland at rates that exceed crop uptake or during the most environmentally unsound times of the year (e.g., winter). Where the per-acre animal density is very high, farmers should consider composting or exporting their excess manure stock to avoid off-site contamination.

If the per-acre animal density is not too high, farmers have several options for controlling runoff:

- Test the manure and the soil (where possible) for nitrogen levels to determine how much manure and commercial fertilizer to apply.
- When applying the manure, incorporate it into the soil to prevent runoff.
- Never apply manure to land where no crops will be grown.

These practices can be incorporated into a nutrient management plan that will balance crop nutrient needs with water quality and runoff control concern. Further investigation of the NPDES program will be necessary to cover all types of significant operation (e.g., poultry) and possible avenues for multi-media pollution, such as ground-water contamination from over-application of manure.

Grazing-related Impairments

Improper and uncontrolled livestock grazing practices have impaired water quality in the United States throughout this country's history. These practices have also have damaged the nation's soil, plant, and wildlife resources.

Riparian areas, those areas along rivers, ponds, and other watercourses, that are impaired by improper grazing often lose their native vegetation, experience soil erosion and bank instability, have lower water tables, and are at an increased risk of flooding. According to the September 1990 *Smithsonian*, degradation of riparian areas in the West is particularly important to control because, while they represent 2 percent of the land area, they support as much as 80 percent of the wildlife.

As of January 1989, the states had listed over 2,000 waterbody segments impaired by rangeland activities and over 3,000 segments impaired by pasture use. Most range-related problems occurred in Idaho, Oregon, Wyoming, and Arizona; most pasture-related impairments occurred in Minnesota, Ohio, Idaho, Kentucky, Oregon, and Illinois.

Federal lands also suffer from livestock grazing. In 1986, the Bureau of Land Management estimated that 80 percent of the riparian areas under its control were damaged by human activities, particularly livestock use. Riparian areas on Forest Service land in the West are also degraded to a large extent from livestock grazing. In 1988, the U.S. Government Accounting Office found that while some BLM areas in 10 western states had been restored, a lack of federal attention to the problem virtually ensured that improvement would be slow. A recent OPPE study of nonpoint source monitoring in 20 randomly selected Bureau of Land Management and Forest Service sites indicated grazing impairment occurred in all 20 areas.

Eliminating livestock impairments of water quality is not limited by a lack of technical management science. In fact, the Bureau of Land Management, Forest Service, and Soil Conservation Service have demonstrated successful grazing systems that not only improve water resource condition but also increase overall livestock production. However, implementing these management practices is limited in a very real way by the following factors:

1. Damaged land and water resources are numerous and widespread.
2. Until recently, water quality has been a relatively low priority for those who plan and manage livestock grazing.
3. Grazing land ownership is multitudinous, including private individuals, corporations, state governments, and the federal government.
4. Federal land management agencies are decentralized, making implementation activities more complex.
5. Administration of federal grazing programs requires extensive human and financial resources.
6. Federal and state land/water resource conservationists must be regularly trained in proper livestock/watershed management.
7. Livestock producers must be made aware of the adverse effects their current improper practices have on the resource and on production and must have access to technical assistance, education, and financial resources to install structural BMPs. Because proper management often takes more time, they may have to hire adequately trained field help for cases in which they personally cannot afford the time to manage the livestock.

Potential Solutions

State nonpoint source control authorities can play a key role in addressing overgrazing by continuing to identify watersheds where overgrazing has led to significant impacts on water resources. Once key areas are identified, nonpoint source agencies can focus attention on outreach to and education programs for relevant federal and state agencies, private landowners, and lessees on public lands.

Federal land managers must play a key role of assuring that their grazing permit programs do not encourage environmental degradation. This objective can be accomplished, in part, by setting regional management priorities to reflect the relative importance of both livestock grazing demand and the threat of grazing impairments. However, in many instances, simply reordering priorities based on ecological concerns may not be sufficient to control potential grazing problems. In these cases, more financial resources will be needed. Adequate resources are needed to hire and train personnel who will be able to continually assess the condition of land and water resources, provide program direction, and assist livestock producers in implementing successful management techniques.

Federal agencies such as the Soil Conservation Service and the Agricultural Stabilization and Conservation Service at USDA could focus their existing outreach programs, both technical assistance and cost-share, on degraded riparian systems. Under the Water Quality Initiative, these two agencies could nominate watersheds needing improved grazing management (as identified by the state nonpoint source agency or by the SCS) to secure a more fo-

cused effort at providing technical and financial assistance. The Extension Service also can play a role through educating the relevant livestock producers.

Other federal agencies can work together to improve water quality in a watershed by expanding grazing planning and management beyond riparian areas. For example, USDA's Conservation Reserve Program (CRP) lands might be used for livestock grazing once the CRP contract has ended. If properly managed to avoid overgrazing, this practice may keep fragile land out of cultivation for a longer period of time as well as relieve grazing pressure on riparian areas—and both can benefit water quality.

All interested parties—nonpoint source agencies, federal managers, ranchers, recreationists, and environmentalists—could become more involved in Coordinated Resource Management (CRM) to meet specific environmental objectives. CRM is a tool that has been applied in several areas in the West where multiple land ownership previously precluded environmentally sound watershed management. In this approach, all the interested parties work together to attempt to achieve a variety of objectives, including improved water and land quality.

The quality of the waters associated with grazing lands will improve minimally until additional resources and training are provided. If grazing management is to be given a higher priority, the staff to provide program management, technical assistance, and education must be increased at least threefold. Moreover, current staff should be trained to better address water quality, riparian management, and planned grazing systems, including proper stocking levels for particular levels.

Low-input Sustainable Agriculture

Low-input sustainable agriculture, or LISA, is the popular term for farming in ways that will continually protect the environment, conserve resources, and assure food safety.

The Food Security Act of 1985 authorized LISA (Subtitle C of Title 14, section 1463, on Agricultural Productivity Research). At present, funds appropriated by Congress for LISA are used for research and education programs; it was originally funded in FY 1988 with \$3.9 million. Annual funding for FY 1989 and 1990 is \$4.5 million.

"Low-input" is a term that means lessening the farm's dependence on purchased additives, especially manufactured chemical pesticides and fertilizers that can harm the environment, impair food, or decrease profitability. LISA farmers rely more on skilled management, scientific know-how, and on-farm resources. Low-input practices vary but commonly include:

- greater use of crop rotation,
- crop and livestock diversification,
- soil and water conservation practices,
- mechanical cultivation,
- greater use of animal manures and nutrient-producing cover crops, and
- biological pest controls.

LISA looks at the farm as a complete system. Integrated pest management (IPM) and best management practices (BMPs) are important components of LISA, but not substitutes. Although LISA may include organic farming practices (i.e., no use of

manufactured chemicals) if it is the best option, wise use of chemicals is compatible with LISA goals.

Driven by necessity to pare costs, LISA farmers have cut back on chemical pest control and the use of commercial fertilizers. Through trial and error, this small group of farmers has found successful LISA methods and reduced initial outlays for specific crops. For example, a 1987 evaluation of USDA's Extension Service IPM programs for nine crops in 10 states found that IPM users had higher average per acre yields than non-IPM users growing the same crop in the same state. This survey of 3,500 farmers also found that in every case, IPM users had higher net returns per acre than non-IPM users.

Alternative crop rotation patterns that require fewer chemical inputs can also significantly reduce costs without compromising yields. For example, a 1987 study of rotations in wheat production published in the *American Journal of Alternative Agriculture* found that inputs for a conventional rotation system (four year wheat-barley-wheat-peas) cost \$129.40/acre compared to \$56.82/acre for an alternative legume-based system (three year peas-black medic-wheat). The yield under the alternative system was 62.6 bushels per acre compared to 60.3 per acre under the traditional rotation pattern.

Substantial research is essential to support this movement, research to determine best methods and BMPs for specific crops, soil types, and climates. Potential benefits include savings on fuel costs and chemical additives, soil conservation, and water quality protection and conservation. LISA methods cannot overcome the effects of drought or flood; however, fewer initial outlays mean smaller losses in bad times and greater economic stability for the farmer.

Composting

Composting is a means by which individuals and the public and private sector can contribute to pollution control through maximizing the efficiency of resource utilization. For example, composting is increasingly being used in this country to keep organic materials out of landfills and produce soil enriching compost products. With dwindling disposal capacity and rapidly rising disposal fees at landfills across the country, composting has become a vital component of many communities' solid waste reduction programs. As 1990 ended, there were approximately 1,500 centralized facilities in the country that composted yard trimmings (including leaves, grass clippings, and/or brush) not to mention the many thousands of backyard composters.

Approximately one-fifth (by weight) of this nation's municipal solid waste is yard trimmings, second only to paper. Other organic materials being composted by various public and private groups include manures, dead poultry, food scraps, food and seafood processing by-products, and municipal sewage sludge.

Composting Process/Product

The composting process is the controlled decomposition of organic materials into a relatively stable humus product, and it uses resources more efficiently by recycling organic matter and nutrients to the soil. Composting reduces nonpoint source pollution through use of its process and/or product. For example, livestock manures can be managed by the composting process to reduce nonpoint source impacts. This is particularly important if otherwise the manure would enter the water directly, if not enough land is available for the manure to be applied directly to the soil, or if land application of the manure would supply excess nutrients to the soil.

An additional benefit of composting is realized through use of its end product, compost. Used as a soil enricher to recycle organic matter and nutrients, its incorporation into the topsoil as humus

- Helps the soil better retain moisture and nutrients,
- Reduces soil loss,

- Improves soil drainage,
- Reduces pollutant loads to surface and ground waters,
- Reduces watering needs, and
- Lowers chemical fertilizer application levels.

Ongoing university and private research indicates that stable composts can also suppress plant diseases.

Mulch—whether it comes from shredding woody materials or from composting—is also beneficial. Mulch helps retain moisture, reduce soil erosion, suppress weeds, and moderate soil temperatures. Where mulch is used to control weeds, herbicides may not be needed. Mulching grass clippings recycles nutrients and organic matter to the soil, thereby saving on chemical fertilizer.

Composting is performed in residential backyards and on private land and farms to serve single or multiple plants or facilities and at centralized facilities to serve single or multiple communities. Residential backyard composting and mulching represent examples of pollution prevention that can be practiced by the public. By putting compost and mulch to work in their yards, households can use fewer chemical fertilizers, pesticides and water, thereby decreasing the potential for adverse effects on water quality and quantity.

EPA FY 1989-91 Activities

EPA undertook efforts to increase the level of composting activity and encourage the use of compost as part of moving toward its national goal of 25 percent solid waste reduction by 1992. These efforts included the publication of *Yard Waste Composting: A Study of Eight Programs* (EPA/530-SW-89-038, April 1989), which details eight municipal programs. EPA also began a market development study for compost that was completed in the fall of 1991.

As described under "Regional Activities and State Programs," EPA has supported the use of composting as a means for controlling nonpoint source pollution by funding, under section 319, a dead poultry composting project in Delaware.

Water Quality Problems Associated with Irrigated Agriculture

Ecological, human health, and welfare risks associated with irrigation return flows are increasingly posing water quality concerns. Return flows containing salt, nitrates, pesticides, and trace metals such as selenium and boron impact surface and ground-water quality and have significant impacts on wetlands and wildlife.

Surface water quality impacts resulting from irrigation practices have been reported by a number of western states. As discussed in Chapter II, agriculture accounts for 50 to 75 percent of reported nonpoint source impacts to the nation's waters. In the 10 western states reporting impacts associated with irrigated agriculture, 22 percent of reported agricultural impacts to rivers and over 50 percent of reported agricultural impacts to lakes are attributed to irrigated agriculture. In many cases, waters do not support their designated uses because of impacts associated with irrigated agriculture.

The best-known case of severe ecological impacts caused by irrigation return flows is the Kesterson Wildlife Refuge. Since the discovery of deformed bird embryos there in 1982, over 25 similar situations have been identified by the Department of Interior to date. Over six years of research and field monitoring since the discovery of impacts in California's San Joaquin Valley have resulted in development of an extensive data set on the ecological risks associated with irrigation return flows. In addition to documenting significant impairments associated with selenium, this research, conducted by the Department of Interior's Fish and Wildlife Service, Geological Survey, and Bureau of Reclamation has established toxicity criteria that can be used to help guide clean-up and management. The following summarizes some of the major findings.

- Of the numerous trace elements mobilized by agricultural drainage, selenium is the element of greatest concern. Arsenic, boron, and mercury may also adversely affect avian health or reproduction.

- Data collected at 27 locations on the San Joaquin and Sacramento rivers indicate boron, molybdenum, and selenium in water were readily bioconcentrated by filamentous algae, providing the first link in the bioaccumulation of trace metals in aquatic systems.

- Selenium tissue levels were sufficiently elevated to indicate that reproductive impairment may be imminent or already occurring in the fish population.

- Field toxicity studies indicated that undiluted tile drainwater can kill fingerling chinook salmon within 28 days. Adult bluegills fed selenium were not killed but fry from treated adults failed to survive. This finding supports field studies that have documented high selenium residues in fish and a gradual loss or absence of young-of-the-year fish.

The distribution and use of irrigation water result in diversion of water for agriculture and a resultant reduction in naturally occurring wetlands. Excess irrigation drainwater often creates new wetlands that are typically of lower environmental quality because of accumulation and concentration of salts, toxics, and nutrients. The diversion and ultimate return of irrigation drainwater to flowing water systems also poses in-stream ecological problems. Typically, water volume downstream of the diversion is reduced, thus habitat availability for fish and macroinvertebrates may decline. Downstream water quality may be impaired by higher concentrations of agricultural or natural contaminants. In cases such as the South Platte River, downstream water users experience significant water quality degradation.

The U.S. Geological Survey estimates that over 150 million acre-feet of water is used for irrigation annually, of which 29 percent is directly returned to surface waters. Return flows in western states are

frequently concentrated at the end of a field and funneled either to another canal, a settling pond, or a drainwater well, resulting in an identifiable point of discharge to either surface or ground water.

EPA's role in managing these discharges has been limited in part because irrigation return flows to surface water are specifically exempt from the National Pollutant Discharge Elimination System (NPDES) permit provisions of the Clean Water Act. Thus, the agency treats them as nonpoint sources and manages them under the provisions of section 319 of the CWA. Because only limited implementation activities have occurred prior to the receipt of FY 1990 section 319 funding, states are just beginning to respond to water quality impacts associated with irrigated agriculture.

Other state and federal laws and activities influence irrigation practices and the resultant water quality and wildlife impacts. For instance, much irrigation water is provided by federal water projects. This water is often provided at subsidized prices that may encourage excessive water use by farmers who may overwater when faced with the comparative costs of water and other farm inputs. Relatively cheap water supplies also allow farmers to grow crops that would normally not be grown in arid climates. Because many of these crops (e.g., fruits and vegetables) may require both intensive water and pesticide use, there is an increased likelihood of greater volume and toxicity of irrigation return flows.

In many western states, incentives to conserve water run contrary to state water allocation rights which allocate a fixed volume of water to users, conditioned upon continued use of that volume. Farmers have little incentive to conserve their water for fear of losing the right to that water in the future. However, in at least two states, recent laws modify this to allow the water right holder some control over conserved water.

Effective techniques to prevent and limit contamination of irrigation drainwater exist; however, these may be highly site-specific. Some techniques used to date include practices to increase agricultural water efficiency, farm practices to reduce chemical inputs, wastewater treatment, and mitigation of ecological damage. For instance, farmers can employ more efficient watering regimes, reduce application rates of pesticides and fertilizers through integrated crop management, and adopt alternative cropping patterns. Reducing water quantity appears to be the most generally effective means of reducing return flows and improving water quality.

Further Department of Interior research on impacts associated with irrigation return flows and techniques for preventing or mitigating those impacts should assist EPA and the states in identifying areas to be targeted for action (e.g., areas with specific soil types, specific cropping patterns, and so forth) to prevent and control damages associated with irrigation return flows.

Using Market Incentives to Promote Nonpoint Source Pollution Prevention and Control

Federal, state and local agencies currently have a mix of regulatory and nonregulatory tools they can use to prevent and control nonpoint source pollution. Included among these tools is the use of market forces to achieve desired pollution reduction. There are a range of economic approaches to address nonpoint source pollution. The following describes several types of approaches.

Point/Nonpoint Source Trading to Achieve Water Quality Goals

One option to reduce loadings of a particular pollutant in a watershed is to allow point and nonpoint dischargers within that watershed to determine the cost-effective combinations of point source treatment upgrades and nonpoint source controls to reduce pollutant loads and to meet water quality goals. Under the concept of point/nonpoint source trading, point source discharges may obtain pollution reduction credits and thus satisfy their permit's water quality-based limitations by controlling (or funding the control of) nonpoint source runoff in the watershed rather than by upgrading their point source controls beyond technology-based levels. In many cases, the incremental cost of removing a unit of pollutant through increased point source controls is far more expensive than the incremental cost associated with removing the same pollutant from a nonpoint source.

Through a trading mechanism, dischargers of a particular pollutant could work with other dischargers of that pollutant in a given watershed to determine how to meet water quality goals through implementation of the most cost-effective controls. To ensure that water quality standards are attained

or maintained, trades of pollution discharge credits need not be equivalent. For example, a point source pollutant discharger could be given one unit of credit toward meeting its water quality-based limitations for every two units of pollutant reductions obtained from a nonpoint source to help ensure an overall decrease in pollutant loadings to the waterbody.

Although pollution reduction trading is attractive from an economic efficiency perspective, implementation of such a program has several limitations. First, it generally can be used only where the point and nonpoint sources in a watershed discharge identical pollutants (for example, reductions in sediments cannot be exchanged for increased BOD as they affect the receiving water in different ways). Second, the magnitude of pollutant generation must be known for all relevant dischargers. Third, trading requires an understanding of any institutional limitations to implementation. Fourth, trading must be supported by a mechanism to ensure compliance by all trading entities, such as the permit system created by Congress to ensure compliance in the acid rain emissions trading program in the Clean Air Act.

An example of how one type of pollutant trading system may be implemented is in North Carolina's Tar-Pamlico river system and the Albemarle-Pamlico Sound. Nutrients have been identified as the primary cause of water quality degradation in the watershed. A nutrient "budget" prepared by North Carolina for the watershed shows that the bulk of phosphorus comes from point sources (75 percent of total phosphorus) such as POTWs and those related to phosphate mining operations at a particular plant. However, after plant renovations, nonpoint sources will become the major phosphorus source. Eighty percent of the nitrogen in the watershed originates from nonpoint sources.

The nutrient management strategy for the watershed includes the concept of nutrient trading between point and nonpoint sources. Under the

strategy, a designated group of dischargers will evaluate their plants to determine operational or minor structural improvements that could be used to meet nutrient limits. If the operators cannot achieve nutrient limits based on these improvements, the balance of the required nutrient reduction is sought through nutrient trading. The point source operators could provide cost-share financing for agricultural BMP implementation as part of the trading program, thereby accelerating implementation of agricultural BMPs and addressing the majority of nutrients in the watershed. It is anticipated that using agricultural BMPs will be a more cost-effective means to meet nutrient limits than upgrading wastewater treatment plant controls. Similar support by municipal treatment operations to control nonpoint source pollution is occurring in Colorado's Dillon Reservoir.

Pollutant trading may also occur among nonpoint sources. However, for this system to work, enforceable baselines for nonpoint source control such as water quality standards, TMDLs (total maximum daily loads), or baseline technologies would be required.

Maine enacted legislation in 1988 to protect lakes from eutrophication and degradation caused by phosphate pollution, particularly that resulting from new development. In implementing this legislation, the State Department of Environmental Protection has developed a method to estimate the amount of additional phosphorus loading an individual lake can reasonably accept. This amount is then allocated on a watershed basis to areas likely to be subjected to development pressure and subsequently to individual development proposals within the watershed. Developers are responsible for applying the allocation to their proposal, calculating permitted phosphorus export from their development, and designing on-site runoff and other controls to meet the watershed phosphorus allocation. The allocations are enforced locally.

Fees and Taxes

Another market-based approach to controlling nonpoint source pollution is the imposition of fees or taxes on products or activities that may result in nonpoint source pollution. Ideally, fees or taxes would be imposed at a rate high enough to provide an incentive for those responsible for generating nonpoint source pollution to change their behavior in order to avoid the fee or tax.

For example, a sales tax on fertilizer or pesticides could be imposed at a level high enough to deter excess application. However, the price of fertilizer is relatively low and studies of fertilizer fees in Europe have indicated that even a 50 percent tax rate does not significantly reduce fertilizer use.

In addition to providing an incentive to modify activities that result in nonpoint source pollution, taxes and fees also can generate revenues that can be earmarked to support nonpoint source prevention and control activities. For example, building permit application fees can be set at a level high enough to provide revenues to operate and maintain storm water controls associated with the development. Similarly, fertilizer fees may be used to support a state nutrient management program, including soil testing and consulting services.

EPA regularly reports on the innovative use of fees and taxes in its *Nonpoint Source News-Notes*. Examples of successful state fee and tax provisions were discussed in a December 1989 workshop sponsored by the National Council of State Legislatures. The techniques included the following programs:

- **Colorado — Cherry Creek Basin Water Quality Authority:** The authority was established by the Colorado legislature in 1988 to address eutrophication problems in the Cherry Creek Reservoir caused by both point and nonpoint source pollution. Of particular concern was runoff from surrounding farms, development, and road construction. The authority has the following revenue-raising options: property tax assessments for property within the Authority's boundaries, developer impact fees (\$280/acre of graded land in the basin), and a \$3 annual reservoir use fee.

The authority generated \$577,000 in its first year. These funds were used to construct holding ponds and develop artificial wetlands to filter nonpoint source runoff before it reached the reservoir.

- **Iowa — Ground-water Protection Fund:** This fund was created in 1987 to address a number of environmental problems including solid waste and household hazardous waste disposal as well as agricultural chemical management. Income for the fund is derived from a per ton fee on solid waste disposal, an annual fee of \$25 for each retailer of household hazardous waste products, a fee of \$0.75 per ton of nitrogen purchased, a pesticide fee ranging from \$250 to \$3,000 on pesticide sellers based on annual sales in Iowa, a pesticide dealers license fee, and an underground storage tank fee of \$65.

Fees on agricultural chemicals represent an attempt to shift farmers away from excessive pesticide and fertilizer use. For FY 1988-90, \$1.9 million was targeted for research on environmentally benign farming practices at the Leopold Center for Sustainable Agriculture.

- **Washington - Puget Sound Storm Water Utilities and Centennial Clean Water Fund:** The Puget Sound Water Quality Authority was established in 1985 to develop a plan to restore and protect Puget Sound's water quality. The plan's nonpoint source component is designed to mitigate pollution from agriculture, septic tanks, urban runoff, and silviculture.

A principal source of revenue is from local water utility fees. The program is also funded by state grants from the Centennial Clean Water Fund, which is generated primarily from an \$0.08 per pack sales tax on tobacco products. Ten percent of the fund, or approximately \$4.5 million per year, is earmarked for the nonpoint source program.

An additional funding proposal has been developed for the 1991 legislative session. The proposal includes two "disincentive" fees; that is, fees that can be avoided if nonpoint source controls are installed. These include an annual \$75 surcharge assessed on landowners with on-site septic tanks or livestock. The surcharge is waived if the septic system is inspected and found to be in good working order or when best management practices to control animal wastes and runoff from farms are installed. A \$6 annual fee would also be assessed to landowners in urban areas. The surcharge would be waived when local comprehensive storm water controls are in place.

Performance Bonds

Performance bonds serve as financial guarantees that certain activities will be performed as a condition of a permit. For example, performance bonds are required of surface coal mining operations to guarantee reclamation and are required of hazardous waste landfill operations to guarantee adequate operation, maintenance, and closure of the site. The bond is refunded once the conditions of the permit are met. In recent years, several states have also adopted performance bond requirements for developers to ensure that adequate erosion control and storm water control measures are implemented. To be effective, performance bonds must be set at a level sufficient to ensure that funds will be available if treatment or environmental restoration is necessary and to ensure that the operator has a financial incentive to comply with the terms of the permit.

To minimize nonpoint source pollution, performance bonds could be required for activities that disturb significant acreage or sensitive environmental areas. Bonded activities could include construction, forestry, and non-permitted mining on both

private and public land. Bonds would be posted before the activity begins and released when the state was satisfied that required measures have been completed.

Market-based Pricing

Nonpoint source pollution is associated with the use of water resources and other natural resources such as timber, grazing land, and mine land, many of which are controlled by federal agencies. The pricing of these resources greatly affects their demand. Low prices may stimulate demand and, in some cases, promote wasteful use or overuse of resources in ways that cause nonpoint source pollution. For example, the Bureau of Reclamation's water prices are far below the market rates for water in the western United States. Grazing fees for BLM lands appear to be far below those on private lands, at least in some areas. This pricing system promotes inefficient resource use, including (1) over-irrigation, resulting in salinity and toxic contamination of irrigation return flows and (2) overgrazing, which may impair aquatic resources by contributing sediment to waterbodies through soil erosion. While it is not clear that fair market pricing will result in dramatic changes in resource management on a per acre basis, such pricing lowers overall demand, reducing pressure on the resource.

Cost Sharing and Subsidies

Federal and state agencies provide a number of cost-sharing and subsidy programs for the private sector. Such programs should be encouraged to support environmentally desirable practices. For example, cost sharing for large capital projects such as animal waste storage and manure composting facilities should be directed toward areas where manure applications currently result in nonpoint source pollution. Subsidies can be direct or indirect (e.g., through state income or property tax credits). Conversely, states should limit cost-sharing or subsidies to practices that may impact or threaten surface or ground water quality.

Volunteer Citizen Monitoring

Citizen monitoring programs such as the Izaak Walton League's Save Our Streams program discussed earlier in the report, create public interest in local watersheds. Interested citizens can encourage adoption of prevention measures and controls for sources of nonpoint pollution in their watershed.