United States General Accounting Office

GAO

Report to the Chairman, Subcommittee on Water Resources and Environment, Committee on Transportation and Infrastructure, House of Representatives

February 1999

WATER QUALITY

Federal Role in Addressing—and Contributing to—Nonpoint Source Pollution

GAO/RCED-99-45

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-281614

February 26, 1999

The Honorable Sherwood L. Boehlert
Chairman, Subcommittee on Water
Resources and Environment
Committee on Transportation and
Infrastructure
House of Representatives

Dear Mr. Chairman:

This report responds to your request that we report on the federal government's role in both controlling and contributing to nonpoint source water pollution.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 7 days after the report's issuance date. At that time, we will send copies to the appropriate congressional committees; the Administrator, EPA; the Chairman, Federal Energy Regulatory Commission; the Director, Office of Management and Budget; and the Secretaries of the Departments of Agriculture, Commerce, Defense, Interior, and Transportation. We will also make copies available to others upon request.

I can be reached on (202) 512-6111 if you or your staff have any questions. Major contributors to this report are listed in appendix VII.

Sincerely yours,

David G. Wood

David G. Wood
Associate Director, Environmental
Protection Issues

Executive Summary

Purpose

Much progress has been made to restore the quality of the nation's waterways since the passage of the Clean Water Act in 1972.[1] This progress is largely attributable to significant efforts to reduce pollutant levels from point sources, which are those that contribute pollutants directly to a body of water from a pipe or other discrete conveyance. But many waters are still heavily polluted, causing ecological damage and posing risks to human health. Continuing problems with water pollution resulted, for example, in over 2,000 fish consumption advisories and more than 2,500 beach closings and advisories in 1996 alone. Overall, the Environmental Protection Agency (EPA) reports that over one-third of the nation's assessed waters are still not meeting water quality standards. Most of these remaining water quality problems are largely attributable to pollutants from nonpoint sources—diffuse sources that include a variety of land-based activities such as timber harvesting, agriculture, and urban development.

Concerned about the impacts of nonpoint source pollution and the potential costs of dealing with the problem, the Chairman of the Subcommittee on Water Resources and Environment, House Committee on Transportation and Infrastructure, asked GAO to (1) provide background information and funding levels for federal programs that primarily address nonpoint source pollution (i.e., those programs identified as either focusing exclusively on nonpoint source pollution or that devote at least $10 million annually to the problem); (2) examine the way EPA assesses the overall potential costs of reducing nonpoint pollution nationwide and alternative methods for doing so; and (3) describe nonpoint source pollution from federal facilities, lands, and activities that federal agencies manage or authorize, or for which they issue permits or licenses.

Background

Nonpoint source pollution occurs when pollutants from diffuse sources are transported by rainwater, snowmelt, or irrigation water through, or over, land surfaces. The pollutants, which vary widely from one source to another, can include sediment, nutrients (chemical elements such as nitrogen and phosphorus), pesticides, pathogens (such as bacteria and viruses), toxic chemicals, and heavy metals. The pollutants are eventually deposited into rivers, lakes, and coastal waters or introduced into groundwater. Airborne pollutants, sometimes transported long distances and then deposited in bodies of water, are also considered a nonpoint

[1]The Federal Water Pollution Control Act, 33 U.S.C. §§1251-1387, is generally referred to as the Clean Water Act.

source. Among other problems, nonpoint source pollution has been documented as affecting aquatic species and contaminating drinking water supplies.

The Congress has historically left the control and regulation of nonpoint source pollution up to the states. In 1987, however, the Clean Water Act was amended to, among other things, authorize EPA to implement a program that provides federal funds and technical assistance to states to develop their own nonpoint source pollution management programs. The act also calls on EPA to estimate the costs of carrying out the provisions of the act. Other agencies are also authorized by various statutes to encourage more environmentally sensitive land use practices that help reduce sources of water pollution. For example, some federal programs use a voluntary cost-share approach to encourage improved land use, particularly with regard to controlling soil erosion and improving agricultural practices.

The Clean Water Act also acknowledges that federal facilities and activities, such as grazing and timber harvesting on federal land, can contribute to nonpoint source pollution. Therefore, the act includes provisions whereby federal agencies are to ensure that their activities are "consistent" with state nonpoint source pollution management programs. States can review certain federal projects and activities to determine whether they conflict with the states' nonpoint source pollution management programs. In accordance with procedures set forth in an executive order, federal agencies are required to consult with the states and make efforts to accommodate the states' concerns or explain their decisions not to do so.

Results in Brief

The federal agencies GAO contacted reported spending about $3 billion annually for fiscal years 1994 through 1998 on 35 programs that they identified as addressing nonpoint source pollution. Some deal directly with nonpoint source pollution; others focus on different objectives (such as reducing soil erosion or preventing health and safety risks from abandoned mines) but still address the problem. While EPA is the primary agency involved in water quality issues given its role under the Clean Water Act, many other federal agencies have programs addressing nonpoint source pollution and, in some cases, devote a significant amount of resources to the problem. In particular, the U.S. Department of Agriculture's (USDA) programs account for over $11 billion, or about 80 percent of all federal funding identified by these agencies. USDA officials

explain that while most of the programs identified by the agency do not have specific nonpoint source pollution objectives, the programs' activities nonetheless help to reduce nonpoint source pollution.

EPA has estimated the annual costs of controlling three major sources of nonpoint source pollution to be $9.4 billion, an amount that represents one of the few systematic attempts at estimating such costs nationwide. Specifically, EPA's methodology to produce the estimate analyzes agriculture, silviculture, and animal feeding operations and estimates pollution control costs for these sources. EPA acknowledges that the methodology has several limitations. Specifically, the methodology (1) does not include the costs of controlling some potentially significant sources of nonpoint pollution and (2) includes capital costs associated with best management practices to address nonpoint source pollution, but excludes the potentially significant operating and maintenance costs associated with these practices. GAO also found that the methodology does not assess and disclose the considerable range of uncertainty associated with EPA's control cost estimate and that it includes insufficient documentation of its cost-estimation methodology. EPA officials told GAO that the agency is considering an additional cost-estimation methodology, a "watershed-based approach," that could provide a substantially more realistic estimate by taking into account the unique characteristics of individual watersheds.[2] The officials noted, however, that resource shortages were constraining the effort. GAO found that researchers at USDA and the U.S. Geological Survey have made progress in developing nationwide watershed models and that improved coordination between EPA and these agencies could help advance EPA's effort.

The federal government manages or authorizes, or issues permits or licenses for, a variety of activities that result in nonpoint source pollution and, in some cases, affect water quality. Pollutants resulting from these activities include sediment, nutrients, and heavy metals. Federal and state officials GAO interviewed identified the following five activities as those with the most potential to contribute significantly to nonpoint source pollution: silviculture (specifically, timber harvesting and associated forest roads), grazing, drainage from abandoned mines, recreation, and hydromodification (such as building and operating dams, or modifying rivers for flood control or other purposes). Federal activities are of particular significance throughout the 11 Western States where the federal government owns at least one-half the land area in about 60 percent of the region's watersheds. The five states GAO contacted—Arizona, California,

[2]A watershed is an area of land in which all surface water drains to a common point.

Colorado, Oregon, and Utah—reported many water quality problems resulting from one or more of these federal activities. In Arizona, for example, the nonpoint source program manager said that federal activities are the primary source of almost 50 percent of all the water quality problems in the state.

Principal Findings

A Diverse Array of Federal Programs Address Nonpoint Source Pollution

Among the agencies GAO contacted, total federal annual spending for nonpoint-related programs remained relatively constant from fiscal year 1994 through fiscal year 1998 at about $3 billion, although obligations among some programs increased significantly during this period. Some programs deal directly with nonpoint pollution; while others focus on different objectives, but also serve to reduce such pollution. In addition, some of the programs provide resources to nonfederal entities to deal with nonpoint source pollution, such as providing resources to farmers to implement certain land management practices, while other programs are focused directly on addressing nonpoint pollution occurring on federal lands.

EPA is the lead federal agency authorized by the Clean Water Act to address nonpoint source pollution. The agency's key activities in this regard focus on (1) providing funding to states to develop and implement nonpoint source management programs or (2) geographic initiatives designed to protect specific watersheds, such as the Chesapeake Bay. EPA programs obligated about $225 million in fiscal year 1998, or about 8 percent of total federal nonpoint source pollution-related obligations. While overall nonpoint funding has been stable over the past 5 fiscal years, EPA's obligations have grown significantly. For example, obligations for nonpoint source activities in the Clean Water State Revolving Fund Program increased from about $21 million to about $96 million from July 1, 1994, through June 30, 1998.[3]

Other agencies' programs devote considerable resources to addressing nonpoint source pollution, in some cases eclipsing the resource commitment of EPA, although many of these programs do not have specific nonpoint source pollution objectives. USDA in particular accounted for

[3]The Clean Water State Revolving Fund Program tracks funding based on a fiscal year running from July 1 through June 30. Therefore, EPA could not report funding based on a federal fiscal year, as used in this report.

about 80 percent of federal funding addressing nonpoint source source pollution in fiscal year 1998. Most of this funding is associated with activities that help reduce pollution from privately owned land, which constitutes about 70 percent of the lower 48 states. Specifically, the two largest USDA programs—the Conservation Reserve Program and the Environmental Quality Incentives Program—accounted for $1.9 billion, or about 72 percent of total obligations for fiscal year 1998. These, and most other USDA programs, are cost-share or incentive programs, or technical assistance programs designed to reduce erosion, improve agricultural practices, and protect water quality. USDA officials explained that 100 percent of the activities and funding associated with these two programs ultimately help reduce nonpoint pollution because of the close relationship between land management, such as soil erosion control measures, and water quality.

The Department of the Interior operates several programs that address nonpoint source pollution with total obligations of about $1.4 billion from fiscal years 1994 through 1998. Interior's largest program, the Abandoned Mine Land Program, accounts for almost 45 percent of the Department's total obligations for nonpoint-related activities for fiscal years 1994 through 1998. This program focuses primarily on reducing the health and safety risks posed by coal mines abandoned before 1977. Other Interior programs conduct water quality research in certain geographic locations and identify specific water quality threats.

Programs identified by other agencies also illustrate the diversity of federal activities that address the problem. The Department of the Army, for example, reported obligating about $20 million in fiscal year 1998 to repair or restore lands damaged primarily by training exercises, such as tank maneuvering and bombing ranges.

EPA's Methodology for Estimating Nonpoint Source Pollution Control Costs Could Be Improved

Estimating the costs to control nonpoint source pollution nationwide is a difficult task. Critical information, such as identification of waters contaminated with nonpoint pollution and the contribution of each of those sources, is not readily available at the local level, much less at a national level. Therefore, EPA developed models to estimate the number of possible sources and the cost of applying management practices to reduce pollution for three categories of nonpoint sources—agriculture, silviculture, and animal feeding operations (those that are not large enough to be considered point sources by EPA).

While EPA's methodology represents one of just a few attempts to analyze this difficult problem nationwide, there is considerable uncertainty with the resulting estimate. Some of the uncertainties relate to potentially key factors that are not included in the cost estimate. Citing a lack of nationwide data, for example, EPA does not include several important categories of nonpoint sources that can be significant contributors, at least in some areas, such as abandoned mines and airborne sources. Also excluded are operating and maintenance costs associated with the best management practices implemented to control the problem. For example, in developing cost estimates for controlling runoff from croplands, EPA assumed that farmers would develop water quality management plans to help them manage the application of fertilizers on their fields. The capital costs farmers would incur to develop these plans are included in EPA's cost estimate. However, farmers could also be expected to incur annual costs such as those associated with testing the soil to determine whether they are meeting the goals of the management plan, and these costs are not included.

Some of the methodology's limitations relate to the presentation of EPA's results. For example, EPA presents its $9.4 billion figure as a point estimate rather than a range, which implies a level of precision that may not be warranted in light of the limited information behind the supporting data and assumptions. Under such circumstances in other studies, EPA has assessed and presented estimates as a range of values. In addition, the agency did not fully document the key assumptions and data used in the analysis, making it difficult to compare the assumptions and data with published sources to assess their reasonableness. For example, to estimate the cost of erosion control on cropland acres, EPA used estimates of the cost of applying various soil conservation practices. According to EPA officials, the cost data were obtained from USDA's Fiscal Year Statistical Summaries (1985-1995). However, without documentation of the actual data used in the analysis, GAO could neither verify the data sources nor assess their reasonableness in comparison with other published sources.

Finally, the methodology does not account for the unique characteristics of individual watersheds that influence the extent to which nonpoint source runoff actually impairs water quality. Under EPA's current approach, for example, data are collected on soil runoff, and the assumption is made that all runoff contributes to pollution. Under a watershed-based approach, the soil runoff data could be combined with data on such things as vegetative cover and rainfall associated with

specific watersheds to more definitively determine the extent to which soil runoff may result in a water quality problem. EPA officials told GAO that they are considering using a watershed-based approach as an additional cost estimation methodology but were concerned about the additional resources the approach might require. The officials noted, for example, that developing a watershed-based model could cost about $750,000, compared with the $25,000 it costs to update and run the existing model. Researchers at USDA and Interior's U.S. Geological Survey, however, have developed nationwide watershed-based methodologies for analyzing potential water quality problems and pollutant sources. These efforts could be useful to EPA in developing a nonpoint source control cost-estimation methodology that is watershed-based.

A Variety of Federally Managed or Authorized Activities Can Contribute to Nonpoint Source Pollution

Under a variety of missions and legislative requirements, federal agencies manage, authorize, or issue permits or licenses for, a variety of activities that provide public benefit but may have the unintended side effect of contributing to nonpoint source pollution. The Forest Service, for example, provides commercial opportunities such as timber harvesting and grazing, each of which can contribute sediment and other pollutants to bodies of water. Federal and state officials GAO contacted identified the following five activities as those with the most potential to contribute significantly to nonpoint source pollution: silviculture (primarily timber harvesting and associated forest roads), grazing, drainage from abandoned mines, recreation, and hydromodification.

The federal government owns at least one-half of the land area in about 60 percent of the watersheds in the 11 Western States (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming) and about 22 percent nationwide. The predominance of federal land ownership in many western watersheds suggests a potentially significant federal contribution to nonpoint source pollution in those areas. State officials in the five states GAO contacted (Arizona, California, Colorado, Oregon, and Utah) confirmed that the federal contribution to the problem, particularly among these states, can be significant. For example, (1) Arizona officials cited nonpoint source pollution from federal activities as the primary source of almost 50 percent of the state's water quality problems; (2) Oregon officials cited nonpoint pollution from federal activities as the primary source of 50 to 60 percent of the state's water quality problems; and (3) almost 50 percent of Colorado's reported problems are affected by drainage from abandoned mines, many of which occur on federal lands.

Recommendations

In order to improve EPA's approach toward estimating the cost of controlling nonpoint source pollution, GAO recommends that the Administrator of the Environmental Protection Agency direct the Office of Water to

- address key limitations in its approach by (1) including the costs of operating and maintaining best management practices, (2) assessing and disclosing the range of uncertainty associated with its control cost estimate, and (3) more fully documenting its cost-estimation methodology and
- work with researchers at the U.S. Department of Agriculture and the Department of the Interior's U.S. Geological Survey to obtain lessons learned, data sources, and modeling approaches to help advance EPA's own efforts to develop a watershed-based cost-estimation approach.

Agency Comments

GAO provided a draft of this report for review and comment to the Departments of Agriculture, Commerce, Defense, the Interior, and Transportation and to EPA and the Federal Energy Regulatory Commission. Comments from the Departments of Agriculture, Commerce, and the Interior and the Federal Energy Regulatory Commission are included in appendixes III through VI, along with GAO's responses. Oral comments and other information were obtained from EPA officials responsible for funding and carrying out nonpoint source pollution-related activities. The agencies offered technical corrections and clarifications on the draft report, which were incorporated as appropriate. The Department of Defense indicated that it concurred with the report's findings and, like the Department of Transportation, chose not to provide specific comments on the report. In addition to appendixes III through VI, the agencies' comments are summarized in chapters 2, 3, and 4.

Of the five agencies providing comments, EPA, the Federal Energy Regulatory Commission, and Interior provided overall reactions to the report in addition to their specific comments. EPA said that the report was factually correct and that it provided a good summary of the current state of nonpoint source pollution that results from federal land management and other activities. However, EPA disagreed with GAO's recommendation that operation and maintenance costs for nonpoint source pollution control efforts be included in the agency's 2000 "Needs Survey" report. The Commission agreed with the report's major conclusions, saying that GAO made an "impressive effort in presenting a very complex topic." Finally, Interior said it had concerns with some of the findings in the draft.

Interior's concerns are discussed below along with the other agencies' specific comments.

EPA and the Departments of Agriculture and the Interior commented on the information in chapter 2 concerning nonpoint source pollution-related funding. Agriculture identified programs omitted in the draft report that met GAO's criteria for inclusion (i.e., programs that either focus exclusively on nonpoint source pollution or that devote at least $10 million annually to the problem). GAO added information in the case of two programs for which Agriculture provided the necessary funding data, but did not do so in the case of one other because funding data were not provided. EPA indicated that the information in this chapter was generally accurate, but officials with the agency's Clean Water State Revolving Fund Program questioned the nonpoint source pollution funding totals attributed to that program. The officials cited in particular the complexity of isolating the federal portion of the funds included in the program because these funds are commingled with state matching funds and funds from other sources. Supplemental information provided by these officials led to a revised estimate, which GAO incorporated into the report. Interior provided clarifications that were incorporated into the report as appropriate.

EPA, the Department of Agriculture, and the U.S. Geological Survey commented on the material in chapter 3 dealing with EPA's methodology for estimating the nationwide cost of controlling nonpoint source pollution. EPA acknowledged that GAO's assessment of the cost-estimation methodology was factually accurate but disagreed with the draft report's recommendation that operation and maintenance costs for nonpoint source pollution control efforts be included in the agency's Needs Survey report, to be issued in 2000. Specifically, EPA said that including this information would represent a major change in the scope of that particular report, which focuses more specifically on the costs of construction of all publicly owned treatment works in each state. For this reason, EPA officials said that reporting this information might be more appropriate in another report. GAO modified the recommendation, noting that the primary concern was that the information on operation and maintenance costs be developed and that the specific vehicle for reporting the information was secondary. USDA's Agricultural Research Service said that EPA's cost estimate should address operating and maintenance costs.

The Agricultural Research Service and the Geological Survey supported GAO's recommendation that EPA work with other agencies to develop a watershed-based approach that can be used in developing more realistic

estimates of nonpoint source pollution control costs. The Agricultural Research Service noted, in particular, that a watershed approach is needed to accurately analyze nonpoint source pollution because the degree of protection provided by natural barriers, such as riparian zones, is specific to individual watersheds. In addition, the Service pointed out that the effectiveness of using various practices to control the movement of potential contaminants can be markedly affected by site-specific conditions. The Geological Survey added that it would be pleased to share information with EPA and USDA concerning its own watershed-based modeling efforts.

The Departments of Agriculture and the Interior, as well as the Federal Energy Regulatory Commission, commented on chapter 4's discussion of federal activities that contribute to nonpoint source pollution. The Forest Service and Interior cautioned that certain figures, such as the percentage of land mass under federal ownership and the number of acres devoted to grazing or other land uses, are not necessarily accurate measures of the amount of nonpoint source pollution attributable to federal activity. Agriculture's Natural Resources Conservation Service added that the presentation in chapter 4 should recognize that proper management practices can mitigate the types of impacts discussed. The studies GAO examined, together with the data and other information GAO obtained from federal and state officials it contacted, do in fact show that a significant proportion of water quality problems have been linked, at least in part, to activities occurring on federal lands. GAO acknowledges that the degree of pollution in specific areas may depend on site-specific characteristics such as geographic and hydrologic conditions, the type of activities occurring and intensity of use, and management practices applied to minimize impacts. Accordingly, as suggested by the Forest Service, GAO modified language to characterize such activities as "potential" contributors to nonpoint source pollution where they have not been demonstrated to be "actual" contributors.

The Federal Energy Regulatory Commission commented that nonpoint source pollution-related impacts can result from Commission-licensed hydropower projects, but cautioned that in characterizing these impacts, the report (1) carefully distinguish between the effects of hydropower versus other activities that change the flow of water (such as building dams for irrigation and modifying rivers for flood control); (2) distinguish between Commission-licensed projects and federally managed projects; and (3) recognize that hydropower is not an original source of some of the impacts identified, but rather a factor that can amplify the effects of other

sources that contribute nonpoint pollution. Regarding the first two points, GAO's draft did recognize the distinctions identified by the Commission, but GAO also made changes to the report to add further clarification. Regarding the third point, GAO agrees that, in some instances, hydropower is not technically the "source" of the pollution, although, as the Commission points out, it may still be a contributor. In other instances, however (such as situations where changes in temperature or dissolved oxygen levels or increased downstream erosion result directly from a project's operations), GAO noted that it is more appropriate to characterize the project as an original source of the pollution.

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Abbreviations

AML	Abandoned Mine Land
ARS	Agricultural Research Service
BLM	Bureau of Land Management
CWSRF	Clean Water State Revolving Fund
CZARA	Coastal Zone Act Reauthorization Amendments
DWSRF	Drinking Water State Revolving Fund
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FERC	Federal Energy Regulatory Commission
GAO	General Accounting Office
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
O&M	Operating and Maintenance
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

Introduction

Over a period of decades, federal laws and regulations have established a process for the Environmental Protection Agency (EPA) and states to regulate "point sources" of pollution. Point sources are generally municipal and industrial facilities that discharge pollutants via a point, such as a pipe or other conveyance, directly to a body of water. EPA and the states issue permits to these entities to put limits on the types and amounts of pollutants such facilities can discharge. These laws and regulations have helped clean up major water quality problems and reduce the amount of pollutants directly discharged into surface waters.

However, many of the nation's waters are still not meeting water quality standards.[1] For example, toxic algae, such as Pfiesteria piscicida, which are associated with excessive amounts of nutrients (chemical elements such as nitrogen and phosphorus) in waters in Maryland, North Carolina, and Virginia, resulted in millions of fish killed and adverse human health effects. Various pollutants have also resulted in over 2,000 fish consumption advisories and more than 2,500 beach closings and advisories being issued in 1996 alone. Overall, EPA reports that over one-third of the nation's waters that were assessed by states are still impaired. Nonpoint sources of water pollution, or diffused sources, have been identified as the primary reason for these continued problems.

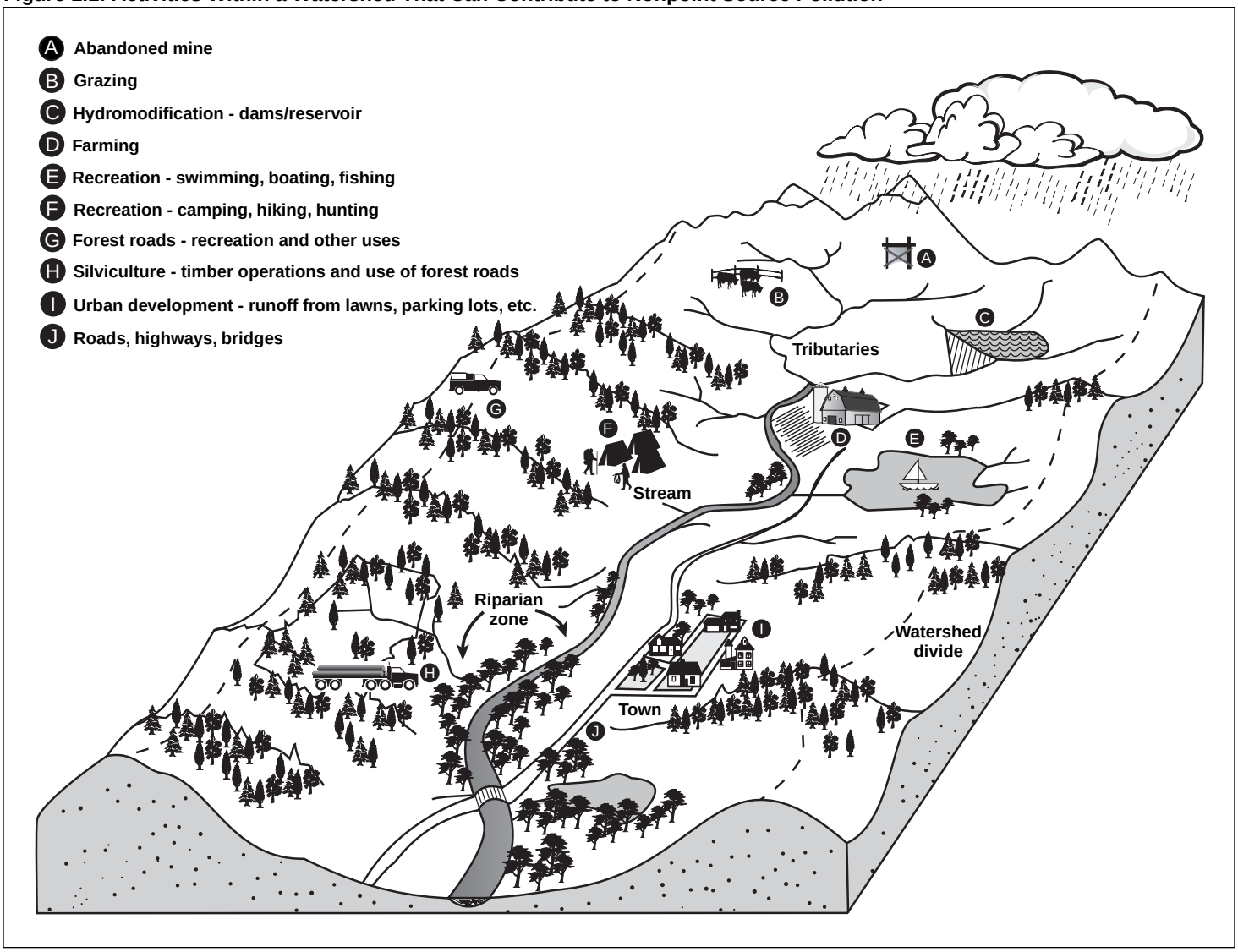
Nonpoint Sources of Pollution Are Varied

Nonpoint sources of water pollution include a wide array of land-based activities such as timber harvesting, grazing, urban development, and agriculture. Figure 1.1 shows many such nonpoint sources in a watershed setting.[2] Pollution comes from these disparate sources via the process of rainwater, snowmelt, or irrigation water moving over or through land surfaces. This results in pollutants, either dissolved or solid, being transported and eventually deposited into rivers, lakes, and coastal waters or introduced into groundwater. Airborne pollutants, sometimes transported long distances and then deposited in bodies of water, are also considered a source of nonpoint pollution, as is polluted groundwater which discharges into surface water. The types of pollutants vary with the activity involved and include sediment, nutrients, pesticides, pathogens (such as bacteria and viruses), salts, oil, grease, toxic chemicals, and heavy metals.

[1]Waters that are not meeting water quality standards, regardless of whether the sources of pollution are from point or nonpoint sources, are also known as impaired waters.

[2]A watershed is an area of land in which all surface water drains to a common point. A watershed can range from less than 100 acres that drain to a stream to many thousands of acres that drain through hundreds of smaller streams to a large, single stream or river.

Figure 1.1: Activities Within a Watershed That Can Contribute to Nonpoint Source Pollution



Sediment is a common pollutant from many nonpoint-generating activities and can impact water quality by contaminating drinking water sources or silting in spawning grounds for certain aquatic species. Another common group of nonpoint pollutants, nutrients, can result in excessive plant growth and subsequent decaying organic matter in water that depletes oxygen levels, thereby stressing or killing other aquatic life. Pesticides, pathogens, and other toxic substances associated with runoff from

agriculture and other sources can also be hazardous to human health and aquatic life. The severity of any nonpoint impact is dependent on the amount of pollutants actually reaching a body of water and the ability of receiving waters to assimilate or transport those pollutants.

Nonpoint source pollution is much more difficult to track than point source pollution. Because the sources are diffused, it is very difficult to pinpoint the exact amount of pollutants coming from individual sources, including that from natural sources of pollution, particularly for pollutants such as sediment that may result from a wide variety of activities and sources. In addition, control practices vary in their effectiveness depending on many site-specific characteristics such as soil type, topography, and climate. As a result, there is much uncertainty in quantifying nonpoint source pollution stemming from specific sources and tracking improvements resulting from control practices.

Federal and State Responsibilities for Controlling Nonpoint Source Pollution

The nature and extent of nonpoint source pollution is essentially a function of the way individuals use the land. Therefore, regulating these activities has been a sensitive issue since land use decisions are largely made at the local level and influenced by state policies. As a result, the Congress has left the actual control and regulation of nonpoint source pollution up to the states while addressing the importance of dealing with the problem in amendments to the Clean Water Act in 1987. Specifically, section 319 of the Clean Water Act, added in 1987, provides a limited federal role in addressing nonpoint pollution. Under this section, EPA provides federal funds and management and technical assistance to states to implement nonpoint source management programs. In their nonpoint source assessments completed in 1989, states identified waters that without additional controls over nonpoint sources, will not meet water quality standards. The states also developed management programs to deal with the problems. In addition, section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990, administered jointly by EPA and the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), outlines a more rigorous process for states to deal with nonpoint sources impacting coastal waters.[3] Section 6217 requires states to address significant sources of nonpoint pollution from agriculture, forestry, urban areas, marinas, and hydromodification. This program differs markedly from section 319 in that states are required to include in their programs enforceable policies and mechanisms to ensure that management measures to address these sources are implemented.

[3]This program also includes states that border the Great Lakes. 16 U.S.C. §1453.

In addition to section 319's explicit authorization of a federal role, other agencies are authorized to encourage more environmentally sensitive land use practices. For example, some federal programs use a voluntary cost-share approach with private landowners to encourage improved land use actions, particularly with regard to controlling soil erosion and improving agricultural practices.

The Clean Water Act acknowledges that federal agencies are also potential sources of nonpoint pollution via their facilities or activities, or those issued permits or licenses by them, such as grazing and timber harvesting. Therefore, the act includes provisions whereby federal agencies are to ensure that their activities are "consistent" with state nonpoint source pollution management programs. States can judgmentally review certain federal projects and activities to determine whether they conflict with the states' nonpoint management programs. In accordance with procedures outlined in an executive order regarding intergovernmental review of federal programs, federal agencies are required to consult with the states and make efforts to accommodate their concerns or explain their decisions not to do so.[4]

In February 1998, the administration proposed a new plan to address the nation's remaining water quality problems.[5] Among the "Clean Water Action Plan's" primary goals are to provide new resources to communities to control nonpoint source pollution, strengthen public health protection, and encourage community-based watershed protection at high-priority areas. The Action Plan also recognizes the role that federal land management agencies must play in protecting the water resources on their lands as well as federal agencies' roles in providing technical and financial assistance to states and private entities to better deal with nonpoint source pollution.

Objectives, Scope, and Methodology

The Chairman, Subcommittee on Water Resources and Environment, House Committee on Transportation and Infrastructure, asked us to (1) provide background information and funding levels for federal programs that primarily address nonpoint source pollution (i.e., those programs identified as either focusing primarily on nonpoint source pollution or that devote at least $10 million annually to the problem);

[4]Executive Order No. 12372, "Intergovernmental Review of Federal Programs", 47 Fed. Reg. 30959 (1982), reprinted as amended in 31 U.S.C. §6506 note.

[5]Clean Water Action Plan: Restoring and Protecting America's Waters, U.S. Environmental Protection Agency and the U.S. Department of Agriculture (Feb. 1998).

(2) examine the way EPA assesses the overall potential costs of reducing nonpoint source pollution nationwide and alternative methods for doing so; and (3) describe nonpoint source pollution from federal facilities, lands, and activities that federal agencies manage or authorize, or for which they issue permits or licenses.

To address the first objective, we surveyed agencies to obtain information on program purpose, key goals and objectives, program funding and staffing levels, matching requirements, and opinions on the potential impact of the Clean Water Action Plan. For relevant Clean Water Act sections, we also included additional questions about how EPA allocates funds across projects, regions, and states. We pretested our survey with officials in the U.S. Department of Agriculture (USDA), EPA, the Fish and Wildlife Service, and the Army Corps of Engineers. In order to identify the most important nonpoint source pollution programs, we asked agencies to respond to our survey for programs meeting at least one of the following two criteria: (1) program expenditures addressing nonpoint source pollution exceeded $10 million for at least 1 year during fiscal years 1994 through 1998 or (2) the program primarily addressed nonpoint source pollution regardless of program expenditures.

We sent survey instruments to over 100 programs that we identified through our prior reports and agency background information and discussions with agency officials at EPA; NOAA; and the Departments of Agriculture, Defense, Energy, Interior, and Transportation. The response rate for our survey was 100 percent.

For the second objective, we reviewed EPA's nonpoint source pollution component of the Needs Survey, examining the analytical structure of the models, the reasonableness of key assumptions, and the completeness of data using standard economic and statistical principles. We also interviewed EPA officials and contractor staff responsible for developing and using the models and requested model documentation. We interviewed EPA staff involved with the 1996 report as well as staff working on the report to be issued in 2000. We consulted with experts in water quality modeling from EPA, USDA's Natural Resources Conservation Service and the Economic Research Service, and Interior's U.S. Geological Survey. We also reviewed pertinent scientific literature to help identify alternative methodologies for a conceptual framework for estimating nationwide control costs.

For the third objective, we identified the primary federal agencies that manage or authorize, or issue permits or licenses for, activities or facilities that result in nonpoint source pollution by interviewing officials at EPA; the Army Corps of Engineers; the Federal Energy Regulatory Commission; and the Departments of Agriculture, Defense, Energy, Interior, and Transportation. We limited our investigation into nonpoint source pollution-generating activities to those that are not regulated under EPA's point source or stormwater permit requirements. For example, we excluded sources such as construction sites larger than 5 acres or certain industrial activities that must comply with stormwater runoff requirements to address nonpoint source pollution.

Because quantitative data on federal agencies' nonpoint source pollution contribution generally do not exist, we developed an array of other indicators to help characterize agencies' possible contributions. The primary factors were the extent of agency involvement in nonpoint source-generating activities, the types of impacts that result from the activities, circumstances that may influence the impacts, and management practices that can minimize the impacts. We developed these factors based on a review of scientific research and discussions with federal and state officials. To collect information on the factors, we interviewed a wide array of agency officials, including headquarters program managers, research scientists, and field staff, to understand the range of activities, resulting water quality impacts, and management practices used. We also reviewed scientific literature that described types and ranges of impacts and results of management practices applied for specific nonpoint source pollution-generating activities.

We interviewed water quality officials from five states with large portions of federal land—Arizona, California, Colorado, Oregon, and Utah—to understand how federal activities factored into state water quality issues. We judgmentally selected these states from states with at least 25 percent federal land in order to obtain information on the types of nonpoint source pollution associated with a diverse array of federal agencies. In addition, we obtained geographic data from the U.S. Geological Survey describing the percentage of land area owned by the federal government in watersheds across the country. We did not verify the reliability of these data.

We conducted our work from February 1998 through January 1999 in accordance with generally accepted government auditing standards. We provided copies of a draft of this report to EPA; the Federal Energy

Regulatory Commission (FERC); and the Departments of Agriculture, Commerce, Defense, Interior, and Transportation, for review and comment. Agriculture, Interior, FERC, and NOAA provided written comments. Their comments and our responses are included in appendixes III through VI. EPA provided oral comments and other information which we discuss at the end of chapters 2 and 3. Defense and Transportation had no comments. We also provided relevant sections of the draft report to representatives of each of the five states included in our review to verify statements attributed to them and other information they provided. We made revisions as appropriate to incorporate their comments.

A Diverse Array of Federal Programs Address Nonpoint Source Pollution

As the nation's lead environmental organization, EPA implements a number of significant programs to deal with nonpoint source pollution. Other federal agencies, however, have also made considerable investments in addressing the problem. USDA funding in particular has eclipsed EPA's financial commitment by a significant margin. Overall, the seven agencies we surveyed reported obligating about $14 billion for fiscal years 1994 through 1998 on 35 programs addressing nonpoint pollution.[1] Total obligations during this period have been relatively stable—at about $3 billion each year—but obligations at EPA in particular, increased significantly during this period.[2] In February 1998, the administration proposed a plan designed to more effectively address the nation's remaining water quality problems. The Clean Water Action Plan proposed $568 million in additional funding for fiscal year 1999, and a total increase of $2.3 billion over the 5 years from fiscal years 1999 through 2003. According to the Action Plan, many of its activities will augment programs at EPA and a number of other agencies to deal with nonpoint source pollution. Recognizing the interdisciplinary nature of the problem, the plan also calls for closer cooperation and coordination among these agencies.

Key Federal Programs That Address Nonpoint Source Pollution

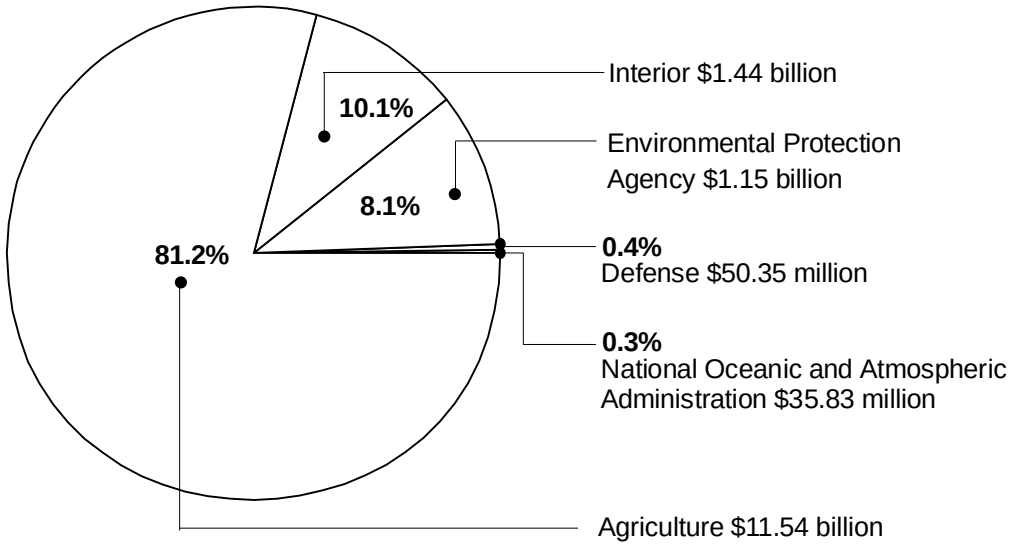
The 35 federal programs identified by the agencies represent a broad array of activities, reflecting diversity in both the nature of nonpoint source pollution and the remedies needed to address it. Some programs are intended to deal directly with the problem. EPA's National Nonpoint Source Program, for example, provides financial and technical assistance to help states develop their own nonpoint source management programs and to fund specific projects. Other programs are primarily focused on other objectives but indirectly serve to address specific nonpoint source pollution problems. For example, Interior's Abandoned Mine Land Program is intended primarily to reclaim abandoned mines for health and safety reasons (e.g., to address dangers such as open mine shafts), but in doing so significantly addresses potentially contaminated stormwater runoff from these facilities. A further distinction among these programs is that some provide financial and technical resources to nonfederal entities to address nonpoint source pollution such as providing resources to farmers to implement certain land management practices, while other programs are focused directly on addressing such pollution on federal

[1]We asked agencies to identify programs that either (1) had expenditures addressing nonpoint pollution exceeding $10 million for at least 1 year during fiscal years 1994 through 1998 or (2) primarily addressed nonpoint pollution regardless of program expenditures. Five of the seven agencies surveyed met one or both of these criteria.

[2]Total obligations include the percentage of appropriated program funds obligated to address nonpoint source pollution plus the estimated dollar amount used for full-time staff, if reported by the agency.

land. As figure 2.1 illustrates, USDA dominates federal nonpoint source pollution obligations, with significant financial commitments also made by EPA and Interior.

Figure 2.1: Obligations Addressing Nonpoint Source Pollution for Fiscal Years 1994 Through 1998, by Agency



Notes: GAO's estimated total based on agencies' data is $14.2 billion (total and individual agency amounts may not add due to rounding).

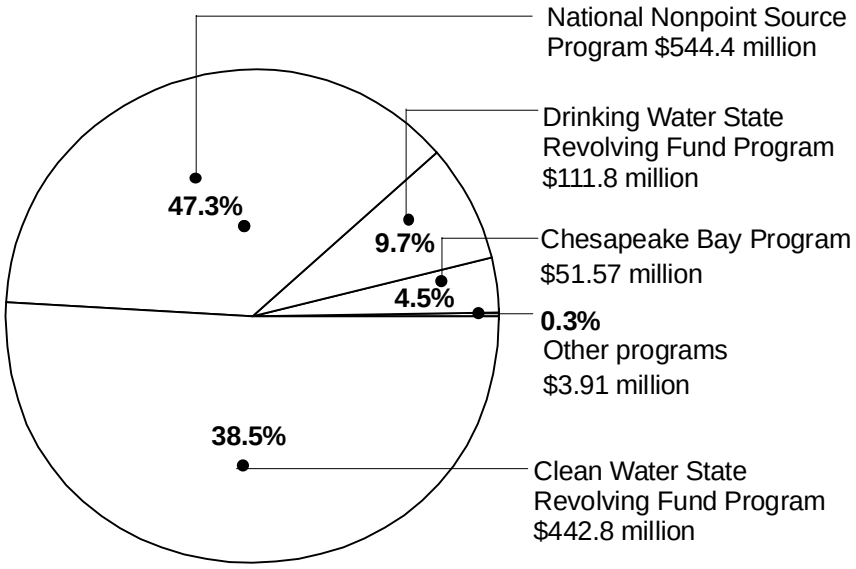
Many programs do not have specific nonpoint source pollution objectives but address nonpoint pollution through other program objectives.

EPA Programs

The primary EPA programs that fund nonpoint source pollution control activities include the National Nonpoint Source Program and the Clean Water State Revolving Fund Program (CWSRF). Overall, about $987.2 million was obligated for these programs to address nonpoint source pollution for fiscal years 1994 through 1998. The Drinking Water State Revolving Fund and the Chesapeake Bay programs also address nonpoint source pollution although their portions of funding to do so are significantly smaller than the National Nonpoint Source and CWSRF programs. As requested, we also identified other programs authorized by the Clean Water Act that address nonpoint source pollution in some manner. The four other programs that we identified are focused primarily on objectives other than nonpoint pollution, and consequently, just a small

amount of program funding went to nonpoint pollution. Background and funding data on these programs are in appendix I. Figure 2.2 shows the percentage breakdown of total obligations for fiscal years 1994 through 1998 for EPA's programs.

Figure 2.2: EPA Obligations Addressing Nonpoint Source Pollution for Fiscal Years 1994 Through 1998



Notes: GAO's estimated total based on EPA data is $1.15 billion (total and individual program amounts may not add due to rounding).

Programs in the "other" category did not meet our criteria for addressing nonpoint source pollution. An estimated $3.91 million was obligated in four programs for fiscal years 1994 through 1998.

Obligations in the Drinking Water State Revolving Fund Program are for fiscal year 1997 only.

The CWSRF Program tracks funds on a different fiscal year. Funds reported are from July 1, 1994, through June 30, 1998.

National Nonpoint Source Program

Section 319 of the Clean Water Act established a national nonpoint source program under which states (1) assessed the extent to which nonpoint sources cause water quality problems and (2) developed management programs to address these problems.[3] EPA was charged with reviewing and approving these programs and is authorized to provide grants to states for implementing their activities and programs. Grants have been used for a

[3]EPA also provides grants to tribes and other jurisdictions to develop and implement nonpoint source management programs.

wide variety of activities, including technical assistance, financial assistance, education, training, technology transfer, and demonstration projects. The funds also support monitoring efforts to assess the success of specific nonpoint source implementation projects.

EPA estimated that for fiscal years 1994 through 1998, the agency obligated about $544 million to address nonpoint source pollution, with obligations of $119 million in fiscal year 1998. According to EPA, all states have approved nonpoint source control programs that are helping to reduce nonpoint source loadings, increase public awareness, and improve water quality. While the program's funding was relatively stable during the 5-year period, its annual funding is significantly higher than it was in prior years. In fiscal year 1990, for example, $38 million was appropriated for the program.

EPA uses a formula to allocate the states' share of the total federal funding appropriated each year for these grants. The formula considers each state's population, cropland acreage, pasture and rangeland acreage, forest harvest acreage, wellhead protection allotment (the acreage around a groundwater drinking source designated for protection), critical aquatic habitat acreage, mining acreage, and amounts of pesticides applied. The formula also includes a set-aside for Indian tribes. Data used in the formula are obtained from the national census, USDA and EPA data bases, and background reports developed on related topics.

Clean Water State Revolving Fund Program

EPA's Clean Water State Revolving Fund Program was established under title VI of the Clean Water Act in 1987 to create, maintain, and coordinate financial programs and partnerships to meet priority community water resource infrastructure needs, primarily those associated with wastewater treatment plants. Under the program, EPA provides grants to capitalize states' funds. The states, in turn, identify investment priorities allowed by the statute and manage the loan program. As a condition of receiving federal funds, states provide a matching amount equal to 20 percent of the total grant and agree to use the money first to ensure that wastewater treatment facilities are in compliance with deadlines, goals, and requirements of the Clean Water Act (also known as the "first use" requirement). In addition to federal and state matching funds, the revolving fund is also funded by the issuance of bonds, interest earnings, and repayments. According to EPA, federal funding currently accounts for about one-half of total program funding. As loans are repaid, the fund is replenished and loans are made for other eligible projects.

All states have met their priority needs and, therefore, may use CWSRF funds to support programs to deal with nonpoint source pollution and protect their estuaries. We reported in 1991 that only two states were using their CWSRF funds to support nonpoint source pollution projects.[4] Since then, however, states' reliance on the CWSRF to fund nonpoint pollution-related activities has grown considerably. According to EPA, 18 states currently use their CWSRFs for this purpose. EPA is encouraging states to use CWSRF funds for nonpoint source control and has set a goal to have 30 states doing so by the end of the decade.

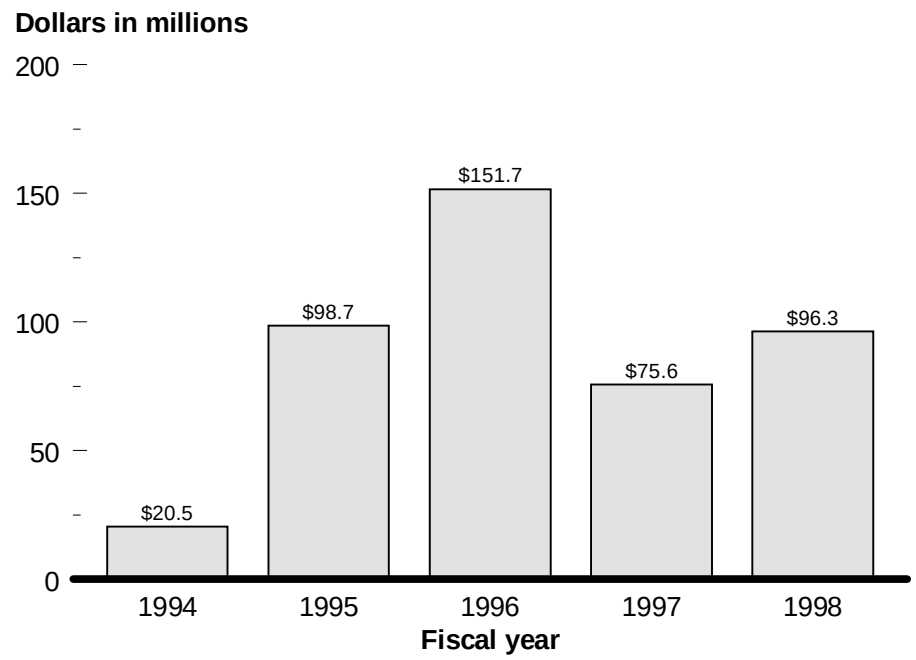
Other EPA goals for increasing CWSRF emphasis on nonpoint pollution include ensuring that CWSRF funding decisions are made in a manner that enables states to direct funds based on environmental priorities—whether they be point or nonpoint in nature. Such a strategy could be expected to place increasing emphasis on addressing nonpoint pollution because most remaining water quality problems are attributed to nonpoint sources. EPA has set a goal for 15 states to be doing so by 1999. In addition, over the next 3 years, EPA plans to increase the number and dollar amount of CWSRF loans annually for polluted runoff control to 10 percent of all CWSRF funds loaned.

Figures provided by EPA show that federal CWSRF funds devoted to nonpoint source pollution has increased significantly in recent years. For example, figure 2.3 shows that funding for nonpoint source pollution increased about 380 percent for fiscal year 1994 through fiscal year 1995.[5] EPA estimates that about $442.8 million of the $7.1 billion appropriated to the program was devoted to addressing nonpoint pollution for the 5 fiscal years included in our study. Federal CWSRF funds to address nonpoint source pollution in fiscal year 1998 was estimated at $96.3 million.

[4]Water Pollution: States' Progress in Developing State Revolving Loan Fund Programs (GAO/RCED-91-87, Mar. 19, 1991).

[5]The CWSRF Program tracks funding based on a fiscal year running from July 1 through June 30. Therefore, funds reported for CWSRF in this report are for the period from July 1, 1994, through June 30, 1998.

Figure 2.3 CWSRF Obligations Addressing Nonpoint Source Pollution for Fiscal Years 1994 Through 1998



Source: Prepared by GAO from EPA's data.

According to EPA, it uses percentages provided by the Congress to allocate funds to states after setting aside 1/2 percent of appropriated funds for Indian tribes for wastewater treatment purposes. The basis for state percentages include population and documented wastewater treatment needs. In addition, 1 percent or $100,000 (whichever is greater) is deducted from each state's allotment for planning purposes—as required by section 604(b) of the Clean Water Act.

The Drinking Water State Revolving Fund Program

The Drinking Water State Revolving Fund Program (DWSRF) was established by Congress under the Safe Drinking Water Act Amendments of 1996 to help public water systems make infrastructure improvements in order to comply with national primary drinking water standards and to protect public health. Funds are distributed among states in accordance with an allotment formula, with the condition that each state receive a minimum of 1 percent of the funds available for allotment. The allotment formula used for fiscal year 1998 reflects the needs identified in the most

recent Drinking Water Infrastructure Needs Survey, the first of which was released in January 1997. States are required to describe the use of funds awarded to them in a plan that is distributed to the public for review and comment. Fiscal year 1997 was the first year for DWSRF appropriations and the program received $1.275 billion; $725 million was appropriated in fiscal year 1998.

Under the DWSRF Program, states can use federal capitalization grant money awarded to them to set up an infrastructure funding account from which loans are made available to public water systems. In addition to authorizing the infrastructure fund, the Congress placed a strong new emphasis on preventing contamination problems through source water protection and enhanced water systems management. States have the flexibility to set aside up to 31 percent of their capitalization grant to develop and implement programs that encourage better drinking water systems operation to ensure a safer supply of water for the public. The four broad set-aside categories for which a state can choose to reserve funds are (1) administrative and technical assistance (up to 4 percent), (2) state program management (up to 10 percent and must be matched dollar for dollar), (3) small systems technical assistance (up to 2 percent), and (4) local assistance and other state programs (up to 15 percent and includes primarily activities devoted to protecting drinking water sources from contamination). According to EPA, states reserved approximately 21 percent of the fiscal year 1997 appropriation to fund set-aside activities.

The local assistance and other state set-asides contain several nonpoint source-related activities. For example, source water protection activities, such as purchasing land as easements to reduce the likelihood of ground water contamination, can help reduce the generation of nonpoint source pollutants. In addition, in fiscal year 1997, states could use this set aside to conduct source water delineations and assessments. These activities identify the areas around groundwater drinking water sources that must be protected to avoid contamination and the possible sources of contamination. EPA reported that 100 percent of the funds obligated for these activities, $111.8 million, should be considered as addressing nonpoint source pollution.[6] In addition to providing funding to delineate and assess source water protection areas, the set-asides made available by the DWSRF Program provide states with funds to implement protection measures. These protection measures can address all sources of

[6]According to EPA, the agency is not yet able to separate nonpoint source pollution-related funding from fiscal year 1998 funds because (1) the office does not yet have a tracking system in place to determine how states use funds and (2) all states have not identified how much funding will be used in each of the four set aside categories.

contamination, which may include nonpoint sources. EPA reports that the state program management and local assistance and other state programs set-asides are the ones most likely to be used for nonpoint source-related activities and can fund activities such as education, loans to public water systems for the purchase of land easements, and community tree planting.

Chesapeake Bay Program

The Chesapeake Bay Program, authorized by section 117 of the Clean Water Act, is a unique regional partnership involving many different constituencies, including federal, state and local agencies; environmental groups; a citizens advisory group; and academia. The program has been directing and conducting the restoration of the Chesapeake Bay since 1983 and is focusing heavily on reducing levels of nitrogen and phosphorus, which are key pollutants responsible for degrading aquatic habitat and the Bay's productivity. EPA estimates that about $52 million was obligated to address nonpoint source pollution out of $101.4 million total program appropriations for fiscal years 1994 through 1998.

EPA uses a formula to allocate about one-half of appropriated funds to the key states in the Chesapeake Bay watershed—Virginia (30 percent), Maryland (30 percent), Pennsylvania (30 percent), and the District of Columbia (10 percent). States must match federal funds dollar for dollar. Funds may be used for various activities such as (1) educating selected audiences on the importance of reducing nonpoint source pollution, (2) preventing excessive livestock contact with streams to reduce streambank erosion and direct nutrient loadings, and (3) monitoring and tracking reduction of point source nutrient loads. A competitive process is used to allocate remaining program funds to specific projects.

Other EPA Programs

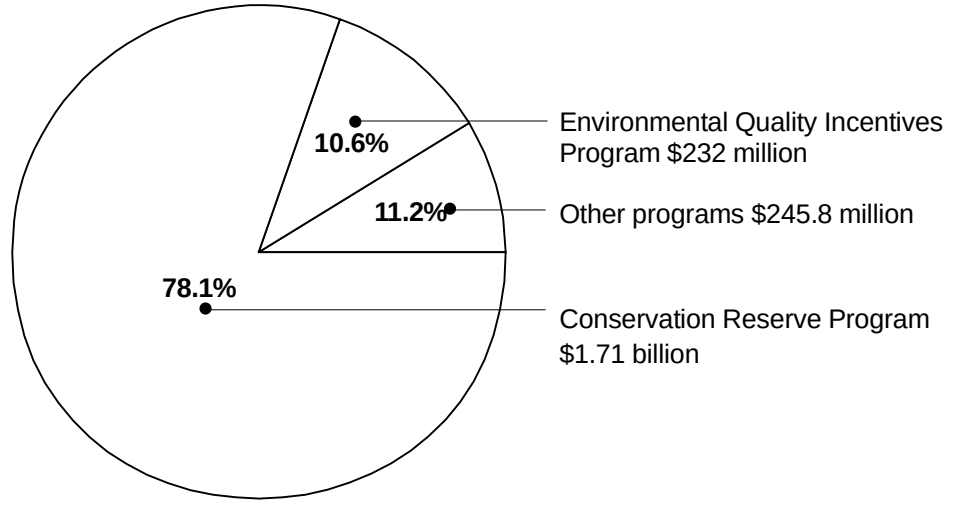
A number of other EPA programs authorized by the Clean Water Act address nonpoint source pollution although not necessarily as a direct program objective. These include the National Wetlands Program (section 104(b)(3)); the Water Pollution Control, State and Interstate Program Support Program (section 106); the Clean Lakes Program (section 314); and the National Estuary Program (section 320). These programs accounted for $3.9 million in nonpoint-related obligations for fiscal years 1994 through 1998 and are discussed in appendix I.

Agriculture Programs

In the late 1980s and early 1990s, USDA began taking a dramatic shift in emphasis on water quality issues because of adverse impacts of agricultural production on water quality. In prior years, USDA's water quality activities were limited in scope. In 1992, for example, we reported

that a small percentage of USDA funds were going to water quality activities—about $62.5 million in fiscal year 1991 of $1.7 billion appropriated for 10 cost-share programs.[7] In contrast, as shown in figure 2.4, USDA reported that the Conservation Reserve and the Environmental Quality Incentives Programs devoted almost $2 billion to nonpoint source pollution-related activities in fiscal year 1998.

Figure 2.4: USDA Obligations Addressing Nonpoint Source Pollution for Fiscal Year 1998



Notes: GAO's estimated total based on USDA data is $2.19 billion (total and individual program amounts may not reconcile due to rounding).

An estimated $245.8 million was obligated in 12 "other" programs in fiscal year 1998. In addition to these programs, USDA provided information, as this report was going to press, on the Wetland Reserve Program showing $218.6 million in fiscal year 1998 funding. While the program could not be reflected in this chart and several other places in the report, a brief description of the program is included in appendix II.

Most USDA programs do not have specific nonpoint source pollution objectives, but help address the problem.

Conservation Reserve Program

By far, USDA's largest source of funding for nonpoint pollution activities is the Conservation Reserve Program, which accounted for about 65 percent of all the federal funds identified in this report obligated to address nonpoint source pollution for fiscal years 1994 through 1998. The program was established in 1985 and has several objectives: reduce water and wind

[7]Water Quality: Information on USDA's Water Quality Cost-Share Programs (GAO/RCED-92-139FS, Mar. 16, 1992). USDA's water quality cost-share programs are programs that provided cost-share payments or moneys to producers—generally, eligible farmers and ranchers—to implement USDA-approved water quality activities on land.

erosion, protect the nation's long-term capability to produce food and fiber, reduce sedimentation, improve water quality, create and enhance wildlife habitat, and encourage more permanent conservation practices.[8] The program encourages private land owners, such as farmers, to remove highly erodible cropland or other environmentally sensitive acreage from production and apply conservation measures to reduce and control erosion and water quality impacts. USDA provides farmers with an annual rental payment for the term of a multiyear contract for taking the land out of production and cost-sharing benefits to apply the necessary conservation measures.

Land may be enrolled in the Conservation Reserve Program by three means: (1) a general signup, which competitively selects the most environmentally sensitive land (most land is enrolled into the program by this method); (2) a continuous noncompetitive signup of highly desirable environmental practices such as filter strips (areas of grass or other vegetation that filter runoff by trapping sediment, pesticides, and other pollutants) and riparian buffers (areas of trees and/or shrubs next to ponds, lakes, and streams that filter pollutants from runoff as well as provide shade, food sources, and shelter for fish and other wildlife); and (3) the Conservation Reserve Enhancement Program,[9] which combines the resources of the federal and state governments to address targeted environmental concerns—such as the Chesapeake Bay. As of October 1998, there were about 30 million acres enrolled in the Conservation Reserve Program.

According to USDA's response to our survey, while the Conservation Reserve Program has no specific nonpoint source objectives, "multiple, indistinguishable benefits for water quality, wildlife habitat, air quality, and erosion control are achieved from all acreage enrolled in CRP." For this reason, USDA officials explained that 100 percent of the Conservation Reserve Program funds should be considered as addressing nonpoint source pollution because all activities carried out under the program involve land use practices that help reduce nonpoint pollution. This amounted to approximately $9.2 billion for fiscal years 1994 through 1998. Program funding in fiscal year 1998 was estimated at $1.7 billion.

[8]The program was established under title XII of the Food Security Act of 1985, Pub. L. No. 99-198, 99 Stat. 1354 (Dec. 23, 1985).

[9]The program began in 1997. Since its inception, about $350,000 has been obligated to address nonpoint source pollution.

Environmental Quality Incentives Program

USDA's Environmental Quality Incentives Program (EQIP) was created by the Federal Agriculture Improvement and Reform Act of 1996 and combined several existing conservation programs—the Agricultural Conservation Program (which includes Water Quality Incentives Projects), the Colorado River Salinity Control Program, and the Great Plains Conservation Program—into a single program.[10] The program provides flexible technical, financial, and educational assistance to private land owners, such as farmers and ranchers, who face serious threats to soil, water, and related natural resources on their land, including grazing land, wetland, forest land, and wildlife habitat. This program provides cost-share assistance for up to 75 percent of the cost of certain conservation practices such as filter strips, manure management facilities, and wildlife habitat improvement.

The primary difference between this program and the Conservation Reserve Program is that farmers do not retire land from production under EQIP. Instead, farmers implement practices that minimize water quality impacts that allow them to continue to use the land; and, unlike the Conservation Reserve Program, EQIP provides cost-share assistance and incentive payments that can be made for up to 3 years to encourage producers to perform land management practices such as nutrient, manure, and integrated pest management. The Conservation Reserve Program, on the other hand, provides annual rental payments for the land taken out of production and focuses on cropland and marginal pasture land while EQIP focuses on a broader range of land uses.

According to USDA, the agency obligated approximately $642 million under this program for fiscal years 1996 through 1998. The agency said that all of the funds addressed nonpoint source pollution, noting that EQIP is intended to solely address nonpoint source pollution from farms and ranches. Program funding to address nonpoint source pollution in fiscal year 1998 was estimated at $232 million.

Other Agricultural Programs

USDA identified 12 additional programs that address nonpoint source pollution. The environmental objectives of the programs vary, ranging from improving scientific understanding of the nature of the problem to direct efforts to reduce nonpoint pollution. The National Research Initiative Competitive Grants Program, for example, provides grants to increase the amount and the quality of science applied to the needs of agriculture and forestry. From fiscal years 1994 through 1998, USDA estimated that about $28.8 million of the $456.3 million total appropriated

[10]Pub. L. No. 104-127 (Apr. 4, 1996).

program funding (plus full time equivalents) was obligated to address nonpoint source pollution, with about $5.2 million obligated in fiscal year 1998. The Watershed Protection and Flood Prevention Program works with state and local entities in planning and implementing watershed improvement projects, such as promoting soil conservation or improving flood prevention. USDA reported that almost 1,000 watershed projects receive funding. In the past 5 fiscal years, this program has obligated about $433 million to address nonpoint source pollution.

Other USDA programs address such diverse objectives as measuring the impact of farming systems on water quality, providing educational and technical assistance programs for voluntary adoption of improved management practices to enhance or protect water quality, and enhancing wildlife habitat. Overall, these 12 additional USDA programs accounted for $1.7 billion of the estimated $11.5 billion USDA obligated to address nonpoint source pollution during the 5-year period. These programs are discussed in appendix II. In addition, the Forest Service noted that a portion of its budget supports controlling nonpoint source pollution, but the agency does not track it in a way that can be reported.

Interior Programs

Within the Department of the Interior, programs related to nonpoint source pollution include those administered by the Bureau of Land Management, the Bureau of Reclamation, the U.S. Geological Survey, the U.S. Fish and Wildlife Service, and the Office of Surface Mining Reclamation and Enforcement. These agencies are involved in water quality efforts because of their primary responsibilities, which include ensuring adequate supplies of water for drinking and agricultural purposes within arid locations of the United States, protecting endangered and other trust species and wildlife habitat, and reclaiming resources impaired by mining activities.

Abandoned Mine Land Program

Among Interior's programs, the Office of Surface Mining Reclamation and Enforcement's Abandoned Mine Land (AML) Program provides the greatest financial contribution toward addressing nonpoint source pollution, accounting for nearly 45 percent of Interior's obligations in the past 5 fiscal years. Created by the Surface Mining Control and Reclamation Act of 1977, this program—mostly run by states with approved programs—restores and reclaims coal mine sites that were abandoned or left inadequately reclaimed before August 3, 1977.[11] Surface mining causes

[11]Pub. L. No. 95-87, 91 Stat. 445 (Aug.3, 1977). In 1990, changes to the act extended eligibility to limited sites mined after Aug. 3, 1977. Abandoned Mine Reclamation Act of 1990, Pub. L. No. 101-508, 6004, 104 Stat. 1388-289, 291 (Nov. 5, 1990).

land disturbances that may result in erosion and exposes minerals that can leach toxic chemicals, if left inadequately reclaimed. While the act was set up to specifically deal with coal mine reclamation, states can use funds to clean up abandoned noncoal sites if all their abandoned coal sites have been completed.

Interior collects fees from all active coal mining operations on a per-ton-of-coal-mined basis, which are deposited into an interest bearing Abandoned Mine Reclamation Fund. Expenditures from the fund are authorized through the regular congressional budgetary and appropriations process, and are used to pay the costs of AML reclamation projects. Realizing that coal fees would not generate the revenue needed to address every potential eligible site, the Congress provided the states and Indian tribes with the flexibility to decide which projects to fund.

The act specifies that 50 percent of the reclamation fees collected in each state and Indian tribe with an approved reclamation program be allocated to that state or tribe for use in its reclamation program. Interior uses the remaining 50 percent for purposes such as funding emergency and high-priority projects in states and Indian tribes without approved AML programs, funding a federal abandoned mine program in USDA, and providing financial assistance to small coal operators (who produce less than 300,000 tons of coal annually). According to agency officials in the Division of Reclamation Support, about 90 percent of total program funds addressed nonpoint source pollution problems. For fiscal years 1994 through 1998, this amounted to approximately $626.3 million, or about $125 million each year.

Other Interior Programs

Interior identified 13 other programs that address nonpoint source pollution. Environmental objectives for these programs vary from efforts to directly control nonpoint pollution to efforts that indirectly control the problem. For example, the Fish and Wildlife Service's Clean Vessel Act Pumpout Grant Program directly addresses nonpoint source pollution by significantly reducing the amount of sewage discharged from boats. According to the Service, for fiscal years 1994 through 1998, $40 million was awarded in grants to states to fund the installation of pumpout and dump stations for land-based disposal of vessel sewage. On the other hand, the Fish and Wildlife Service's Partners for Fish and Wildlife Program indirectly addresses nonpoint source pollution by restoring habitat such as providing native, diverse riparian habitat (areas alongside rivers, lakes, and ponds) for certain migratory birds and aquatic species. These efforts help reduce nonpoint pollution by providing vegetation along

bodies of water, which helps slow stormwater runoff and trap pollutants such as sediments and nutrients. In addition, several Bureau of Land Management programs obligate funds that address nonpoint source pollution on federal lands through a variety of objectives, such as enhancing riparian habitat and managing rangelands to protect water quality.

Other program objectives include controlling salinity in the Colorado River and recording long-term spatial and temporal trends in atmospheric deposition. The remaining 13 programs accounted for about $810.7 million of Interior's total estimated $1.4 billion obligated to address nonpoint source pollution over the past 5 fiscal years. These programs are discussed in appendix II.

Other Federal Programs

In addition to the EPA, USDA, and Interior programs, a few other programs were identified at the Departments of Commerce and Defense that target nonpoint source pollution problems either directly or indirectly. These programs accounted for a very small portion, less than 1 percent, of overall federal obligations on nonpoint source pollution for fiscal years 1994 through 1998. In addition, some agencies such as those at the Departments of Defense and Transportation spend significant funds to control certain classes of nonpoint source pollution that are regulated under EPA's stormwater permit program that also address other nonpoint sources in the process. However, these expenditures were not captured in our review.

One program, administered by NOAA, is the Coastal Zone Management Program created under the Coastal Zone Management Act of 1972.[12] The program is a voluntary partnership between the federal government and U.S. coastal states and territories that is intended to preserve, protect, develop, and where possible, restore and enhance the nation's coastal resources. The statute also encourages the preparation of special area management plans that specify how significant natural resources are to be protected and promote reasonable coastal economic growth, improved protection of life and property in hazardous areas, and improved predictability in government decision making. NOAA estimated that of the $229 million total appropriated funding, it obligated approximately $23.8 million (including full time equivalents) for fiscal years 1994 through 1998 to address nonpoint source-related problems.

[12]Pub. L. No. 92-583, 86 Stat. 1280 (Oct. 27, 1972), 16 U.S.C. 1451-1465.

A second program, co-administered by NOAA and EPA, is the Coastal Nonpoint Pollution Control Program, authorized by section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990. The amendments require states and territories to develop and implement coastal nonpoint pollution control programs. Once approved, these programs are to be implemented through changes to the state nonpoint source program approved by EPA under section 319 of the Clean Water Act and through changes to the state coastal zone management program. To help states develop their programs, EPA published management measures for several categories of nonpoint pollution sources, such as agriculture, urban, forestry, marinas, and hydromodification, that lay out possible controls for reducing pollution from these sources. NOAA estimated that it obligated 100 percent of appropriated funds (plus full time equivalents)—$12 million for fiscal years 1994 through 1998—to address nonpoint source pollution.[13]

The Department of the Army reported that its Integrated Training Area Management Program integrates Army training and other mission requirements for land use with natural resource management practices at Army installations used for training programs. The practices are directed at repairing existing damage to land and preventing future environmental compliance problems. The program provides a process for surveying and monitoring natural resource conditions, integrating training requirements with land condition status, and rehabilitating and repairing damaged areas. The program also provides environmental awareness training. For fiscal years 1996 through 1998, Army officials estimated that $50.4 million of the $95.1 million in total appropriated funding was obligated to address nonpoint source pollution.

Defense officials noted that the Department spends the necessary resources addressing stormwater runoff from its facilities. While many of these activities respond to specific industrial stormwater permit requirements such as controlling runoff from an aircraft maintenance facility, the officials told us that they often also address other nonpoint sources as well. For example, Defense officials told us that in dealing with a stormwater permit requirement (which may include preventing pollutants from entering into a waterway or municipal stormwater system), they will often incorporate runoff from nearby areas that would have otherwise remained as an uncontrolled nonpoint source. This consolidates stormwater runoff and helps reduce the volume of uncontrolled runoff from these facilities. Defense did not report

[13]No funds were appropriated to this program in fiscal years 1996 and 1997. Funds reported during these years were for full-time staff that were used to address nonpoint source pollution. In addition, $1 million of the program's funding was provided by EPA in fiscal year 1998.

obligations for projects such as this, however, since funds to address nonpoint pollution were combined with stormwater permit requirements and could not be separated easily.

Similarly, a significant amount of the Department of Transportation's funding is devoted to minimizing the impacts from highway construction and operation through the Surface Transportation Fund. For example, Transportation reported that about $288 million of these funds were obligated in fiscal year 1998 to address stormwater runoff. However, the majority of these funds were identified as primarily addressing runoff from road and highway construction projects that must meet stormwater permit requirements and thus, are not discussed in this report. Some funds are eligible for specific nonpoint control projects such as retrofitting roads with detention ponds or vegetated buffers to better deal with runoff and minimize water quality impacts. A Transportation official reported that expenditures for these types of projects probably did not exceed our $10 million threshold and like the Department of Defense would be difficult to separate out from other program obligations.

Clean Water Action Plan to Further Address Nonpoint Source Pollution

In October 1997, the Vice-President directed EPA and USDA to work with other federal agencies and the public to develop a Clean Water Action Plan. The plan, issued in February 1998, acknowledged the progress that had been made in past decades by focusing largely on point sources of pollution, but maintained that additional steps—and a more holistic approach—were needed to improve progress toward achieving the nation's water quality goals. Specifically, the plan emphasizes the need to identify and address the major pollution sources affecting entire watersheds, whether they be from point sources, nonpoint sources, or a combination of the two. The plan proposes an increase in federal water quality spending of over $2.3 billion during the next 5 fiscal years. The plan also proposes to focus federal dollars on priority problems by increasing coordination among the many federal agencies involved in this issue.

The plan recognizes the increased importance of nonpoint source pollution in explaining the problems affecting many watersheds, noting that "polluted runoff is the greatest source of water quality problems in the nation today." Accordingly, much of the plan, and a significant portion of funding under the plan, focuses on this problem. The Congress appropriated full funding of EPA's proposed increases under the Action Plan. Of particular note, the plan nearly doubles the size of the state grants

provided under EPA's National Nonpoint Source Program from its fiscal year 1998 funding of $105 million to $200 million in fiscal year 1999.

However, not all agencies received funding increases. For example, the plan proposed increasing the funding for USDA's Environmental Quality Incentives Program by 50 percent, from $200 million in fiscal year 1998 to $300 million in fiscal year 1999. Instead, the fiscal year 1999 budget decreased the funding by $26 million, to $174 million in fiscal year 1999. Also, the plan proposed an increase of $36 million for the Army Corps of Engineers, but none of these additional funds were appropriated.

Agency Comments

The Department of Agriculture's Natural Resources Conservation Service (NRCS) and Agricultural Research Service (ARS) each noted the omission of certain programs in this chapter. Specifically, NRCS cited the Wetlands Reserve Program and the Forestry Incentives Program, and ARS cited certain research activities as programs that should be added. We included programs in this chapter and appendix II based on information we received from agency officials who were asked to identify programs that addressed nonpoint source pollution meeting our criteria (e.g., programs that primarily focused on nonpoint source pollution or programs that spent at least $10 million a year addressing nonpoint source pollution regardless of program focus). We added information provided by USDA on the Wetland Reserve Program and ARS' Water Quality/Research, Development, and Information Program in appendix II. We did not include information on the Forestry Incentives Program because program and funding data were not provided.

Interior's Office of Surface Mining also commented on this chapter. The office said that while it did not disagree with the data presented, it could not verify the estimate of percent of resources going to nonpoint source pollution for the AML Program. The data we reported were obtained from the agency's response to our survey on the program and subsequent information provided by the Division of Reclamation Support. We clarified this point by providing specific attribution to the information in the report.

EPA indicated that the information in this chapter was generally accurate, but officials with the agency's CWSRF Program questioned the nonpoint source pollution funding totals attributed to that program. The officials cited in particular, the complexity of isolating the federal portion of the funds included in the program because these funds are commingled with state matching funds and funds from other sources. Supplemental

information provided by these officials led to a revised estimate, which we incorporated in the report.

EPA's Methodology for Estimating Nonpoint Source Pollution Control Costs Could Be Improved

The Clean Water Act requires EPA to report periodically to the Congress an estimate of the costs of carrying out the provisions of the act. In addressing this requirement, EPA reported in 1997 that the nationwide cost of controlling selected sources of nonpoint source pollution would be $9.4 billion (in 1996 dollars).[1] The estimate represents the capital costs that farmers and others might incur in applying best management practices and other measures to control run off from agriculture, silviculture, and certain animal feeding operations. Although EPA's study represents one of the few attempts to estimate control costs nationwide, EPA officials acknowledge that their methodology has several limitations. Specifically, the methodology (1) does not include some potentially significant nonpoint sources of pollution and (2) includes capital costs associated with best management practices to address nonpoint source pollution but does not include the potentially significant costs of operating and maintaining these practices in subsequent years.

EPA officials told us they are considering an additional approach to estimate nonpoint source control needs. Of particular note, the officials said that they are considering whether to develop a "watershed-based approach" that could better take into account the unique characteristics of individual watersheds. Such an approach would likely provide a more realistic estimate of the nation's nonpoint source pollution control needs. The officials noted, however, that resource shortages were constraining the effort.

Clean Water Act Requires EPA to Report to the Congress on Water Quality Project Needs

Under the Clean Water Act, EPA is required to report to the Congress every 2 years on the estimated cost of carrying out the provisions of the act. Historically, EPA's report, known as the Clean Water Needs Survey, has focused on estimating the costs of construction, or capital costs, of all needed publicly owned treatment works (e.g., waste water treatment plants) which are funded under the CWSRF. However, as reported in chapter 2, with increased emphasis on nonpoint source pollution, states are able to use CWSRF funds for nonpoint source control projects. As a result, EPA began also estimating the capital costs associated with controlling several types of nonpoint sources of pollution. According to EPA, the report, in addition to informing the Congress on water project needs, can help the states and EPA plan how they will attain and maintain Clean Water Act goals by giving them a comprehensive picture of the projects and other activities necessary to meet water quality standards.

[1] 1996 Clean Water Needs Survey Report to Congress, U.S. Environmental Protection Agency, (Sept. 1997). The last Needs Survey report was issued in 1992.

To estimate wastewater treatment needs, EPA has relied on the states to document their capital needs. Because few states had systematically documented their nonpoint source control needs, however, EPA had to develop a methodology for estimating the capital costs to control nonpoint source pollution nationwide. The methodology estimates (1) the number of possible nonpoint sources for three categories of sources—agriculture, silviculture, and animal feeding operations—[2] and (2) the cost of applying best management practices to those sources. EPA estimated just the capital costs associated with these sources.[3] The annual costs that might be required to operate and maintain the practices are not included.[4]

To estimate the cost of controlling soil erosion associated with agricultural activities, EPA used data from USDA's 1992 National Resources Inventory database to identify agricultural lands within each state requiring erosion control. The database, which is compiled by USDA every 5 years, includes information on farming activity, soil erosion, and current soil conservation practices for a sample of acres within each state. On those agricultural lands requiring erosion control, EPA assumed best management practices would be applied to reduce erosion, with the least costly measure selected first. In addition to the best management practices, EPA assumed that farmers would develop water quality management plans to help them manage the application of fertilizers and pesticides that can also run off and cause water quality problems. The capital costs associated with applying both the conservation measures and developing the water quality management plans were aggregated by state, and a nationwide cost estimate was calculated. Nationwide costs for controlling agricultural nonpoint pollution were estimated to be $3.8 billion in 1996.

Similarly, to model the needs for silviculture, EPA estimated the capital costs associated with applying best management practices on harvested sites on privately owned forest lands in the United States using data from

[2]Animal feeding operations contain fewer than 1,000 animal units (an animal unit is a unit of measurement for comparing different animals). Large animal feeding operations, called concentrated animal feeding operations, can be regulated as point sources under the Clean Water Act and, therefore, would not be eligible for funding under CWSRF.

[3]Capital costs are the upfront costs that farmers and others would incur in implementing best management practices and other measures on their land.

[4]EPA's methodology also does not account for certain opportunity costs like the social welfare losses that might be associated with reducing nonpoint source pollution nationwide. For example, removing highly erodible cropland from production would reduce the amount of land available for growing crops, all else the same, and increase the price of certain agricultural goods. In response, consumers might reduce their consumption of these goods which would represent a social welfare loss. It is possible, however, that these losses would be outweighed by the benefits associated with reducing nonpoint source pollution.

USDA's 1992 Forestry Resources of the United States. Federal lands were not considered because these lands are not eligible for funding under CWSRF. EPA used information from its 1992 economic analysis of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) to identify best management practices that could be applied to forest lands.[5] These practices included controlling erosion from timber access roads, stabilizing streambanks near harvest sites, and ensuring re-vegetation of harvested sites. The capital costs associated with implementing the best management practices were aggregated by state, and a nationwide estimate was derived by adding the state values. Overall, EPA estimated that the capital costs associated with controlling runoff from silvicultural activities on private forest lands nationwide would be about $3.5 billion in 1996.

To model the needs associated with controlling animal waste runoff from animal feeding operations, EPA estimated the number of operations in each state using data from USDA's 1992 Census of Agriculture. EPA assumed that each feeding operation would require a nonpoint source management plan for reducing contaminated runoff, and that none of the existing feedlots had any best management control practices already in place. The estimated cost of developing the nonpoint source management plan and the cost of implementing best management practices to reduce runoff represent the cost of controlling nonpoint source pollution at these sites. Overall, EPA estimated that the cost of controlling runoff from these feeding operations nationwide was about $2.1 billion in 1996.

As depicted in table 3.1, EPA's estimate of $9.4 billion for controlling nonpoint source pollution represents the sum of the costs for the three categories of nonpoint sources. The 1996 estimate represents a slight decrease from the 1992 estimate of $10 billion, primarily reflecting, according to EPA, a decline in the number of animal feeding operations.[6]

[5]Regulatory Impact Analysis: Management Measures Guidance for Nonpoint Source Controls in Coastal Watershed Areas, U.S. Environmental Protection Agency, (Dec. 28, 1992).

[6]EPA states that this reflects a trend toward larger concentrated animal feeding operations.

Table 3.1: Estimated Capital Expenditures for Controlling Nonpoint Source Pollution Nationwide

Dollars in billions (1996)

Needs category	1992 Survey	1996 Survey
Agriculture	$ 4.2	$3.8
Silviculture	2.7	3.5
Animal feeding operations	3.1	2.1
Total	$10.0	$9.4

Source: EPA.

EPA's Methodology Has Several Limitations

EPA officials acknowledge that their methodology has several limitations, including the omission of (1) the cost of controlling runoff associated with other potentially significant sources of nonpoint source pollution such as abandoned mines and (2) the cost of operating and maintaining the best management practices implemented to control pollution. In addition, the methodology does not assess and disclose a range of uncertainty associated with its single-point control cost estimate, and does not include sufficient documentation of its cost-estimation methodology so that reviewers could compare its underlying assumptions and data with published sources (and thereby more easily assess the reasonableness of its results).

Methodology Does Not Include Other Potentially Significant Nonpoint Sources

As EPA acknowledges in its 1996 Clean Water Needs Survey report, the methodology considers only selected sources of nonpoint source pollution—agriculture, silviculture, and animal feeding operations. Many other sources of nonpoint pollution contribute to water pollution and therefore may require some controls in order to meet Clean Water Act goals. These sources include abandoned mines, atmospheric deposition, hydromodification, and marinas and urban areas not required to have a stormwater permit. In addition, federally authorized activities on federal lands such as silvicultural operations are not included since they are not eligible for CWSRF funds. As a result, only a portion of the total costs that would be associated with controlling nonpoint source pollution nationwide are included.

Other studies indicate that runoff from other sources can be significant. For example, in its 1994 analysis of President Clinton's Clean Water Initiative, EPA estimated that there were 15,000 to 50,000 abandoned mine sites on federal lands causing water quality problems. The estimated cost to remediate these sites ranged from $330 million to $1.1 billion per year,

in 1993 dollars ($354 million to $1.2 billion in inflation-adjusted 1996 dollars).[7] Furthermore, data aggregated by the Office of Surface Mining from state estimates show that abandoned mines on private lands would cost a total of an additional $2.6 billion to reclaim. EPA officials stated that other categories of nonpoint sources were not included because of a lack of nationwide information.

Methodology Does Not Include Costs of Operating and Maintaining Best Management Practices

EPA also acknowledged that its methodology does not account for the annual operating and maintenance (O&M) costs that farmers and others might incur in implementing best management practices and other management measures to control erosion. As a result, only a portion of the total cost that might be associated with implementing best management practices is accounted for. In developing cost estimates for controlling runoff from croplands, for example, EPA assumed that farmers would develop water quality management plans to help them manage the application of fertilizers on their fields. The capital costs farmers would incur to develop these plans are included in EPA's cost estimate. However, farmers might also incur annual costs such as those associated with testing the soil to determine whether they are meeting the goals of the management plan.

EPA has omitted operating and maintenance costs because the Needs Survey has historically been focused on projects that can be funded under CWSRF, and O&M costs are not eligible for these funds. However, EPA officials acknowledge that they are not limited to including just capital costs in their report, and that accounting for O&M would (1) provide a more complete picture of the nation's needs for controlling nonpoint source pollution and (2) make the Needs Survey a more useful tool for EPA and the states in planning how they will attain and maintain Clean Water Act goals. EPA officials told us that they will allow states to report nonpoint source control O&M costs, but that the Needs Survey will continue to report only the capital costs eligible for CWSRF funding.

EPA's Methodology Does Not Fully Assess the Uncertainty Associated With Estimating Control Costs

In developing the cost estimates, EPA did not fully assess the uncertainty that is associated with the underlying assumptions and data used in the analysis. Accordingly, EPA's 1996 Clean Water Needs Survey report presents the control costs for each source category as single point estimates. Such a presentation, however, implies a level of precision that

[7]President Clinton's Clean Water Initiative: Analysis of Benefits and Costs, U.S. Environmental Protection Agency, (Mar. 1994).

may not be warranted given the limited information behind the data and assumptions. EPA officials acknowledge that the $9.4 billion cost estimate is subject to a range of uncertainty although they did not calculate it.

In other studies, EPA has assessed uncertainty and presented its estimates as a range of values. For example, in its 1992 economic assessment of management measures developed in accordance with the CZARA, EPA estimated that the cost of controlling nonpoint source pollution in coastal areas throughout the United States would range from about $390 million to $591 million per year, in 1992 dollars (about $449 million to $681 million in 1996 inflation-adjusted dollars). In addition, in its 1994 economic assessment of President Clinton's 1994 Clean Water Initiative, EPA estimated that the costs associated with implementing nonpoint management programs on agricultural lands across the United States would range from about $595 million to $985 million per year, in 1993 dollars (from about $638 million to $1.1 billion in 1996 inflation-adjusted dollars).

Cost Estimation Methodology Is Not Fully Documented

We found it difficult to thoroughly evaluate EPA's methodology because it did not fully document the key assumptions and data used in its analysis. Consequently, we were unable to compare these assumptions and data with published sources to assess their reasonableness. For example, to estimate the cost of erosion control on cropland acres, EPA used estimates of the cost of applying various soil conservation practices. According to EPA officials, the cost data were obtained from USDA's Fiscal Year Statistical Summaries (1989-1995). Without documentation, however, we could not verify that the data were obtained from the publications cited, or whether they are reasonable in comparison to other published sources.

Watershed-Based Approach Offers a Promising Alternative to Estimate Control Costs

Addressing the limitations mentioned previously can improve EPA's cost estimation methodology and resulting cost estimate, but the agency is also considering an additional approach that would take into account the unique characteristics of individual watersheds. Agency officials indicated, however, that the added cost of this "watershed-based approach" could constrain such an effort. A USDA official involved in similar work suggests that improved coordination between EPA and this agency could help advance EPA's effort.

Current Methodology Does Not Account for Unique Characteristics of Watersheds

EPA's current methodology relies primarily on data collected on a countywide or statewide basis—data that were collected along political boundaries rather than watershed boundaries. The practical effect of this limitation is that the effects of the unique characteristics of individual watersheds are not taken into account in estimating either pollution levels or the costs of controlling them. For example, to estimate nonpoint source runoff from croplands, EPA used information on soil erosion and productivity to estimate soil runoff from croplands within each state.[8] However, this may not accurately represent the soil that actually enters a waterbody because it measures soil runoff only to the edge of the farm field, and not whether a water quality problem exists.

The extent to which soil runoff actually enters a body of water and impairs water quality can vary across watersheds, depending on factors like the proximity of land use activities to a waterbody, soil type, slope, the duration and intensity of rainfall, vegetative cover, and the environmental sensitivity of the water resource. EPA's methodology does not take these factors into account and essentially results in estimating costs to apply best management practices to agricultural activities that result in soil runoff, rather than on activities that explicitly affect water quality. In contrast, a watershed-based approach allows the consideration of unique characteristics of watersheds that influence the extent to which runoff from a field or other source enters a waterbody or underlying aquifer and impairs water quality.

According to EPA, such an approach can also develop information that can help states plan more cost-effective water pollution control strategies. In its 1996 Clean Water Needs Survey report to the Congress, EPA stated that, reporting needs on a watershed basis would enable states "to assess both the point and nonpoint pollution sources in the watershed, and to address them in the most cost-effective way."

Other Agencies Have Made Progress in Developing and Using a Watershed Approach

EPA officials told us that a significant barrier impeding the use of a watershed-based approach is the additional resources the approach would require. The officials said that developing a watershed-based model to estimate nonpoint source pollution costs could cost about $750,000, compared with the $25,000 it costs to update and run the existing model. Research activities underway at other agencies, however, could facilitate EPA's effort.

[8]Soil runoff is defined as soil loss in excess of the amount needed to maintain the productivity of the soil to grow crops.

Researchers at USDA's Natural Resources Conservation Service have developed a nationwide, watershed-based methodology to assist decisionmakers in identifying priority watersheds for water quality protection from agricultural nonpoint source pollution.[9] Using primarily the National Resources Inventory database and factors such as precipitation and agricultural chemical use, the researchers assessed the potential for these contaminants to leach into an underlying aquifer or run off into a body of water. Those watersheds having a high potential for a combination of pollution sources (e.g., chemical and soil loss) were identified as candidates for conservation programs to reduce nonpoint source runoff. Although the methodology does not assess whether the runoff enters a body of water and impairs water quality, it goes further than EPA's current methodology toward linking sources of nonpoint source runoff and water quality impairments by identifying those watersheds that are most vulnerable to water pollution. In addition, the research suggests that a more cost-effective reduction in nonpoint source pollution could be achieved by targeting public investments on conservation measures in specific high-priority watersheds.

Researchers at the U.S. Geological Survey (USGS) developed a different watershed-based approach. Their methodology statistically correlates water quality conditions to possible sources—point sources, applied fertilizers, livestock waste, runoff from nonagricultural land, and atmospheric deposition of nitrogen—and watershed attributes that affect contaminant transport (such as soil permeability and precipitation). This approach allows for prediction of contaminant concentrations at specific locations, as well as, characterizing regional water quality. USGS has used its approach to model nitrogen and phosphorus transport, and is finalizing results of an application which assessed the most cost-effective approach to applying controls to point and nonpoint sources to reduce nitrogen and phosphorus loadings in coastal areas. The USGS model could be useful for EPA's purposes in that it would allow for the development of nonpoint source control cost estimates that focus on sources that are linked to water quality problems.

Our contacts with researchers at USDA and USGS suggest that a watershed-based methodology would likely yield a more realistic estimate of nonpoint source control costs than one based on EPA's current methodology. An official at USDA asserted that EPA's efforts could benefit from watershed-based modeling research at USDA and other agencies. EPA

[9]See Potential Priority Watersheds for Protection of Water Quality from Nonpoint Sources Related to Agriculture, Robert L. Kellogg, Susan Wallace, and Klaus Alt. Poster presentation at the 52nd Annual Soil and Water Conservation Society Conference, 1997.

officials indicated that they were not aware of the efforts at USDA and USGS but in discussions with us, agreed that it would be useful to learn more about these efforts.

Conclusions

As noted in this chapter, a number of improvements can and should be made to EPA's methodology for estimating the cost of controlling nonpoint source pollution in order to increase its comprehensiveness and to ensure that its process and results can be reviewed and understood. In addition, EPA's consideration of another cost-estimation strategy that relies on a "watershed-based approach" has the potential to provide a more realistic cost estimate. Such an approach also has the potential to serve as a tool for identifying and prioritizing watersheds most likely to have water quality problems and potentially where the most cost-effective use of resources could be applied to reduce nonpoint source pollution. It is unclear whether EPA will pursue this approach in its next Needs Survey report, given the resources that would be required to do so. However, working with USDA and USGS could provide lessons learned, data sources, and modeling approaches, that would help shift EPA's nonpoint source pollution control cost-estimation methodology in this constructive direction.

Recommendations

To improve EPA's approach toward estimating the cost of controlling nonpoint source pollution, we recommend that the Administrator of EPA direct the Office of Water to

- address key limitations in its approach and presentation of the methodology and its results by (1) including the costs of operating and maintaining best management practices, (2) assessing and disclosing the range of uncertainty associated with its control cost estimate, and (3) more fully documenting its cost estimation methodology and
- work with researchers at USDA and USGS to obtain lessons learned, data sources, and modeling approaches to help advance EPA's own efforts to develop a watershed-based cost-estimation approach.

Agency Comments

EPA acknowledged that our assessment of the cost-estimation methodology is factually accurate, but disagreed with the recommendation in our draft that operation and maintenance costs for nonpoint source pollution be included in the next Needs Survey report to be issued in 2000. Specifically, the agency said that including this information would

represent a major change in the scope of the report as required by section 516(b)(1)(B) of the Clean Water Act, which requires EPA to report on the costs of construction of all publicly owned treatment works in each of the states. For this reason, EPA officials said that reporting operating and maintenance information might be more appropriate in another report. Our concern was that the information be developed, rather than with the specific vehicle in which it would be reported. Therefore, we have modified the recommendation to emphasize that this information be developed, regardless of its reporting mechanism.

EPA did not respond directly to the other recommendations that the agency assess and disclose the range of uncertainty associated with its control cost estimate, more fully document its cost estimation methodology, and work with researchers at USDA and USGS to advance its efforts to develop a watershed-based cost estimation approach. On the last of these recommendations, EPA asked us to clarify that it was not considering the watershed-based approach as a replacement for existing cost-estimation activities that it believes must continue for a number of reasons, but rather as a supplement to these activities. We added language to clarify EPA's position on this matter.

USDA's Agricultural Research Service shares the concern expressed in our draft report that EPA's estimated cost of controlling nonpoint sources of pollution does not include the operational costs associated with the use of best management practices. The Service is also supportive of the recommendation to use a watershed-based approach in estimating the cost of controlling nonpoint source pollution, noting agency research has established that the protection provided by natural barriers, such as riparian zones, is watershed specific. In addition, the Service pointed out that the effectiveness of using certain practices to control the movement of potential contaminants can be markedly affected by site-specific conditions within watersheds.

USGS' comments elaborated on our findings regarding the issue of uncertainty in nonpoint source control cost estimates providing specific examples of possible uncertainty. USGS said that uncertainty exists for many contaminants because they have not yet been tested for controls and, therefore, control strategies for addressing them have not been developed. In addition, USGS pointed out that some best management practices might be effective at controlling only certain contaminants and, therefore, some areas will require multiple controls to address nonpoint source pollution. Last, USGS noted that the implementation of some

controls may cause new pollution problems that will also have to be addressed. USGS also said that it would be pleased to work with EPA and USDA to provide insights regarding watershed-based modeling of nonpoint source contamination and estimating costs for mitigating contamination.

A Variety of Federally Managed or Authorized Activities Can Contribute to Nonpoint Source Pollution

Federal agencies manage, authorize, or issue permits or licenses for, a variety of activities that provide public benefit but may also contribute to nonpoint source pollution. Federal and state officials that we contacted identified five of these activities as those with the most potential to contribute significantly to nonpoint source pollution: silviculture (specifically timber harvesting and associated roads), grazing, drainage from abandoned mines, recreation, and hydromodification. Several other activities managed or authorized by federal agencies were identified by state and federal officials as contributing to nonpoint source pollution in some watersheds, such as farming and irrigation, but were not highlighted as significant concerns.

The federal government owns about 20 percent of the land area in the lower 48 states, and this land is concentrated in the west. As a result, many western watersheds are dominated by federally owned land and the associated federally managed or authorized activities that may cause nonpoint source pollution.[1] According to the nonpoint source program managers that we interviewed in five Western States, many water quality problems in their states result from one or more of these federal activities.

Federal Activities With the Most Potential to Contribute Significantly to Nonpoint Source Pollution

In pursuit of widely varying missions and legislative requirements, federal agencies manage, authorize, or issue permits or licenses for, a variety of activities that provide public benefit such as recreation, timber harvesting, and livestock grazing. For example, the Forest Service (USFS) and the Bureau of Land Management (BLM) provide for timber harvesting and livestock grazing on their lands as well as for recreational opportunities. Figure 4.1 identifies which federal agencies included in our review manage or authorize the activities identified by state and federal officials as being the nonpoint sources of most concern.

[1]Not all federally authorized activities occur on federal land. Licensing of private hydropower projects and highways constructed with federal aid are examples.

Figure 4.1: Activities Contributing to Nonpoint Source Pollution That Are Managed or Authorized by Each Agency Included in Our Review

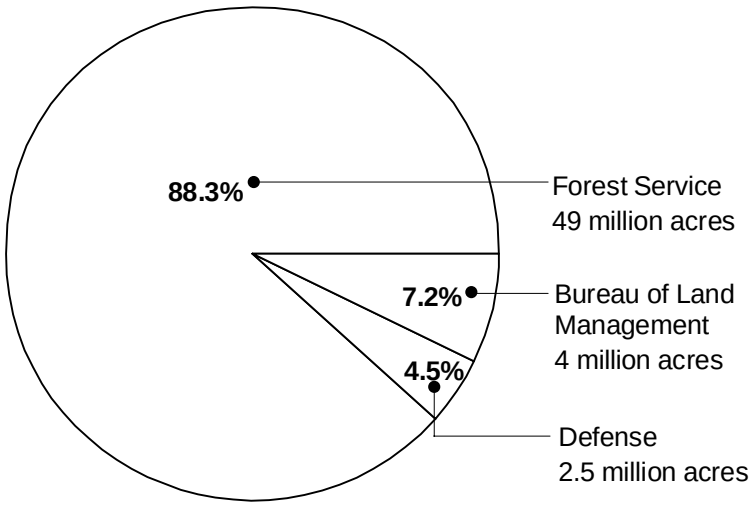
Agency	Silviculture	Grazing	Abandoned mine lands	Recreation	Hydromodification
Forest Service	X	X	X	X	
Bureau of Land Management	X	X	X	X	
Fish and Wildlife Service	X	X	X	X	
Park Service		X	X	X	
Bureau of Reclamation		X		X	X
Dept. of Defense	X	X	X	X	
Army Corps of Engineers		X		X	X
Federal Energy Regulatory Commission				X	X

Source: Prepared by GAO using agency data.

Silviculture — Timber Harvesting and Forest Roads

Silviculture includes the management and care of forests, such as timber harvesting, road construction, replanting, and chemical treatments. As figure 4.2 shows, the Forest Service owns most of the federal timberland suitable for timber harvesting. According to the federal and state officials we interviewed, the majority of nonpoint source pollution resulting from silvicultural activity results from roads constructed for timber removal, although timber harvesting and the transportation of logs from a harvest area can also contribute significantly to water pollution. Other silvicultural practices such as site preparation, prescribed burning, and chemical applications were not cited by state or federal officials as significant sources of nonpoint pollution overall.

Figure 4.2: Federal Ownership of Timberland Suitable for Harvest, by Agency



Source: Prepared by GAO using agency data.

Timber Harvesting

Timber harvesting can be a significant source of nonpoint pollution. However, USFS officials emphasized that the timber harvest itself is typically a less significant cause of nonpoint source pollution than associated activities required to transport logs from the harvest site, such as hauling logs along trails known as skid trails. The movement of logs from the harvest site typically involves the use of heavy equipment, such as tractors, to haul logs along skid trails to landings where they can be loaded onto trucks. The use of heavy equipment and skidding of logs compacts the soil and can severely disturb land surfaces. Rain falling on these areas tends to run off the surface, allowing sediment to flow more easily into streams.[2]

USFS is the dominant federal agency involved in timber harvesting. However, timber harvesting on USFS lands has been declining significantly in the past decade, from 12.7 billion board feet in fiscal year 1987 to 3.3 billion board feet in fiscal year 1998, a decline of over 70 percent.[3] Accordingly, associated activities such as the use of skid trails have also declined. BLM is the only other agency with a significant level of timber harvesting with 239 million board feet in fiscal year 1997.

[2]For more details, see Oregon Watersheds: Many Activities Contribute to Increased Turbidity During Large Storms (GAO/RCED-98-220, July 29, 1998).

[3]A board foot is a unit of quantity for lumber equal to the volume of a board 12 X 12 X 1 inches.

The amount of nonpoint source pollution generated by timber operations varies considerably depending on (1) site-specific conditions, such as the stability of the soil and the slope of the land where the harvest occurs, and (2) management decisions, such as the choice of log transport method, which is a key determinant of the amount of ground disturbance that will be caused by the operation. Forest Service research shows that nonpoint pollution generally results from a timber harvest when there is a large amount of surface disturbance on steep slopes or when riparian vegetation is removed or modified. For example, clear-cutting on steep slopes in the Pacific Northwest has led to significant increases in the number of landslides that deposit large amounts of sediment. In addition, the manager of the nonpoint source unit in Oregon told us that past timber harvesting operations in the state have resulted in removal of riparian vegetation and consequent reduction of streamside shade, which causes elevated stream temperatures that are considered harmful to some fish species.

Recognizing the need to reduce soil erosion and other nonpoint source impacts resulting from silvicultural activities, the Forest Service and BLM have moved away from the use of clear-cutting as a harvest method. For example, clear-cutting on Forest Service lands has declined significantly in the past 5 years, from 132,674 acres in fiscal year 1993 to 45,854 acres in fiscal year 1997, a decline of about 65 percent. In addition, Forest Service and BLM timber contracts are to include requirements to implement best management practices, appropriate to the conditions of the site being harvested, to reduce water quality impacts. For example, a contract may require that skid trails and landings be designed to minimize erosion or that the lifting of logs from the harvest area occur via helicopter when slopes are steep. Forest Service officials were confident that existing requirements regarding management practices would, if followed, reduce nonpoint source pollution. However, the Forest Service does not systematically aggregate data regarding the implementation of the requirements.

Forest Road

Harvesting timber often requires the construction of numerous miles of forest roads to move heavy equipment into the harvest areas and up and down hillsides. The Forest Service has inventoried about 373,000 miles of roads on Forest Service lands. BLM has inventoried almost 75,000 miles of roads on its lands, though the majority of BLM roads were constructed for commercial use other than forest products such as for oil and gas, mineral, and grazing activities. About 14,000 miles of BLM roads have been constructed in Oregon and Washington where 85 percent of

BLM-authorized timber harvesting occurs. Forest Service and BLM officials noted that few new roads have been constructed in recent years, and little new construction is planned. The officials also pointed out that there are many other uses for which forest roads stay open after a harvest is completed, and the majority of traffic on forest roads are from these other uses. Officials from both the Forest Service and BLM told us that, overall, roads are among the two most serious threats to water quality on lands they manage. According to Forest Service officials and scientific literature, roads are considered to be the major source of erosion from forested lands, contributing up to 90 percent of the total sediment production from forestry operations.

Historically, forest road construction standards were not focused on reducing the potential for erosion and associated water quality impacts. Poorly designed and sited roads can change natural stream flowpaths, which leads to incision, or cutting away, of previously unchanneled portions of the landscape and increased erosion. Roads also concentrate stormwater runoff on road surfaces of exposed and often-compacted soil, and may channel flow into adjacent ditches, where eroded sediment from hillsides and roadbeds can be more easily transported to streams. We observed such channel incision and erosion on Forest Service land in Arizona. (See fig. 4.3.)

Figure 4.3: Channel Incision From Forest Road

Sediment from roads can contribute to water quality problems. For example, we recently reported that forest roads were one of several sources of sediment that led to exceedances of turbidity in drinking water and the shut down of several drinking water systems during an unusually heavy storm in western Oregon.[4] Scientific literature shows that aquatic habitat and fish populations can also be adversely affected. Mass erosion resulting from roads can lead to the filling of stream pools, which causes them to support fewer fish and may increase fish mortality. In addition, fine sediment can fill crevices in stream gravel that would otherwise serve to protect juvenile fish and provide spawning grounds.

Forest Service and BLM officials told us that they have attempted to begin minimizing impacts from roads—within current budget constraints and priorities. For example, the Forest Service and BLM have formal management guidance specifying several engineering practices that may reduce the impacts of roads on water quality. These practices include halting timber operations in wet weather; constructing drainage ditches, culverts, and other structures for controlling erosion; inspecting and maintaining roads during and after winter storms; and creating stream-side buffers to minimize water quality impacts. Figure 4.4 shows a Forest Service road improvement project installed to change the way the road diverted stormwater runoff in order to reduce stream velocities and subsequent erosion.

[4]Turbidity is a measure of sediment and other solids in water. Certain levels of turbidity are unsafe for human consumption. For more details, see Oregon Watersheds: Many Activities Contribute to Increased Turbidity During Large Storms (GAO/RCED-98-220, July 29, 1998).

Figure 4.4: Forest Service Road Improvement Project

Road improvement to reduce steambank erosion. Mulitiple culverts employed to divert and slow flow.

Vegetation recovery.

In addition, the Forest Service recently began developing a new roads policy. The three key objectives of this policy are to: (1) provide Forest Service managers with new scientific and analytical tools with which to make better decisions about when, where, and if new roads should be constructed; (2) decommission unnecessary and unused roads, as well as unplanned or unauthorized roads; and (3) improve forest roads where appropriate to respond to changing demands, local communities' access needs, and the growing recreational use of Forest Service lands.

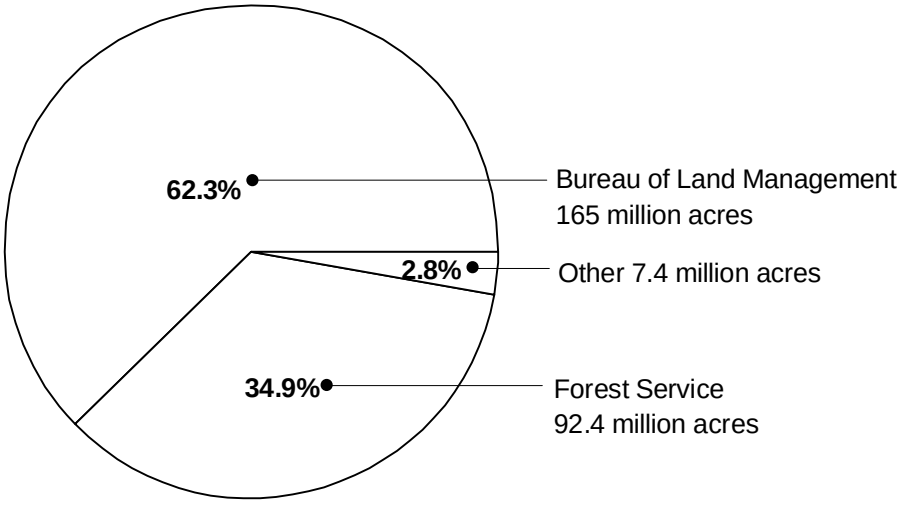
One state official we interviewed expressed concern that the Forest Service will face significant challenges in closing roads, since signage and gates used to close them can be ignored by people wanting to use the roads for recreational purposes. The Forest Service already has significant problems with unauthorized vehicle use of forests. Repeated use has created over 60,000 miles of unauthorized roads throughout the National Forest System, in addition to the 373,000 miles of roads previously mentioned. Figure 4.5 shows examples of unauthorized roads, which can also accelerate erosion and can contribute sediment to nearby waterbodies.

Figure 4.5: Unauthorized Roads on Forest Service Land

Grazing

As figure 4.6 shows, BLM and USFS own most of the federal land available for grazing. Officials from both BLM and the Forest Service said that livestock grazing is among the two most significant contributors of nonpoint source pollution on lands they manage. The state officials we talked with also expressed concerns regarding nonpoint pollution resulting from grazing on public lands. In Oregon, for example, the manager of the nonpoint source unit told us that federally authorized grazing contributes to the degradation of about 30 percent of all impaired waters in the state.

Figure 4.6: Acreage Available for Grazing by Federal Agency



Note: Other includes 5 million acres for the Park Service and 1.4 million for the Fish and Wildlife Service.

Source: Prepared by GAO using agency data.

Grazing can result in nonpoint pollution in several ways. Continuous grazing can lead to a reduction of vegetation that would otherwise serve to protect soil surfaces from the erosive impact of rain. Livestock may also strip vegetation from bushes and shrubs, de-stabilizing root structures and loosening soils, making the soils more vulnerable to runoff during a major storm event. Grazing in riparian areas, which are located in and alongside streams, can lead to a loss of vegetation that would otherwise serve to filter sediment in the streamflow, stabilize streambanks, and provide shade that moderates stream temperatures to levels tolerable for aquatic species. Continuous grazing also leads to trampling of surfaces, causing soil compaction. This reduces rainfall infiltration and in turn leads to increased runoff. Trampling can also cause streambanks to slump and erode, resulting in direct deposit of streamside soil into waterbodies. In addition, direct deposits of manure can occur when animals graze near waterbodies and can lead to fecal coliform and pathogen contamination.[5]

[5]Fecal coliform bacteria (the most common member being Escherichia coli, or E. coli) indicates that water has been contaminated with human or animal feces and may also contain other pathogens or disease producing bacteria or viruses found in fecal material. Some waterborne pathogenic diseases include typhoid fever, viral and bacterial gastroenteritis, and hepatitis A.

Figure 4.7 shows a streambank that is beginning to erode due to loss of vegetation through grazing and a healthy riparian area where grazing has been excluded. Livestock grazing is not the only source of grazing impacts, however. Wildlife, such as elk and deer, graze federal lands and can cause significant impacts such as loss of vegetation and fecal coliform contamination in some places. According to Arizona officials, uncontrolled populations of wildlife are among the state's most serious threats to water quality.

Figure 4.7: Healthy Riparian Area and Eroded Streambank

Healthy riparian area.

Eroded stream bank from grazing activity.

BLM officials acknowledge that grazing causes damage to the riparian stream environment. They note that almost three-quarters of the agency's nearly 40,000 miles of riparian stream environment in the lower 48 states have been assessed to determine ecological condition. Of these assessed stream miles, BLM reported that 14 percent, or almost 4,000 miles, are "non-functional" or do not provide adequate vegetation to slow streamflows that would otherwise cause significant erosion. Another 45 percent of the stream miles are classified as "functional—at risk" and most are declining or have no apparent condition trend.[6] BLM officials added, however, that the precise impact of grazing on the riparian environment is difficult to isolate from that of other sources.

[6]BLM only assesses a condition trend for stream miles determined to be "functional—at risk."

State and federal officials told us that while impacts from current grazing are significant in some areas, the impacts vary considerably depending on several factors, including soil and vegetation type in forage areas, the duration and intensity of grazing, and management practices implemented to mitigate nonpoint source impacts. Proper management of grazing lands can often reduce or minimize nonpoint pollution from grazing. However, the officials we talked with said that federal efforts to actively manage grazing are often limited by insufficient staff and resources.

In addition to the effects of present-day grazing, many watersheds throughout the west have not fully recovered from the heavy grazing that occurred on public lands around the turn of the century. Officials from California, Colorado, and Oregon said that past heavy grazing such as in the late 1800s in each of these states has led to long-term dramatic effects in many watersheds.

Abandoned Mines

Abandoned mines are categorized as those abandoned or left inadequately restored. Federal agencies have identified almost 100,000 abandoned mine sites on federal land across the country, though federal inventories do not use consistent definitions of "site." Because of varying definitions, a site may range in size from a small exploratory hole, or single shaft, to a large area encompassing numerous shafts and large open pits. (See fig. 4.8.) Abandoned mines on federal land are primarily hardrock mines and occur almost exclusively on lands managed by BLM and the Forest Service. To date, 70,000 abandoned mines have been inventoried on BLM lands, 39,000 on Forest Service lands, 2,500 on National Park Service lands, and 240 on National Wildlife Refuges.

Figure 4.8: Abandoned Mines

Mining disturbs rock surfaces and generates piles of waste rock and mine tailings, which exposes minerals in the rock to air and water, accelerating natural rates of oxidation. The oxidation of sulfide minerals, such as pyrite (iron sulfide), generates strong acids, which can drain or run off with stormwater into streams. Acidic conditions in streams can have severe consequences for aquatic life by interfering with biological processes such as reproduction. For example, a Park Service study found that many aquatic species that once existed in major portions of the Cumberland River in Kentucky now exist only as isolated remnant populations possibly because of acid drainage from abandoned coal mines.

Acids from mine drainage can also dissolve metals, such as copper, zinc, manganese, and aluminum, that can be carried into surface waters in toxic concentrations. High concentrations of metals in surface waters can threaten ecological health. According to a Forest Service official, a few livestock fatalities have occurred as a result of ingesting selenium while grazing in areas contaminated by drainage from abandoned mines on National Forest lands in Idaho. In addition, plant growth has been severely disrupted by acid mine drainage from the abandoned McLaren and Glengary gold and copper mines on the Custer and Gallatin National

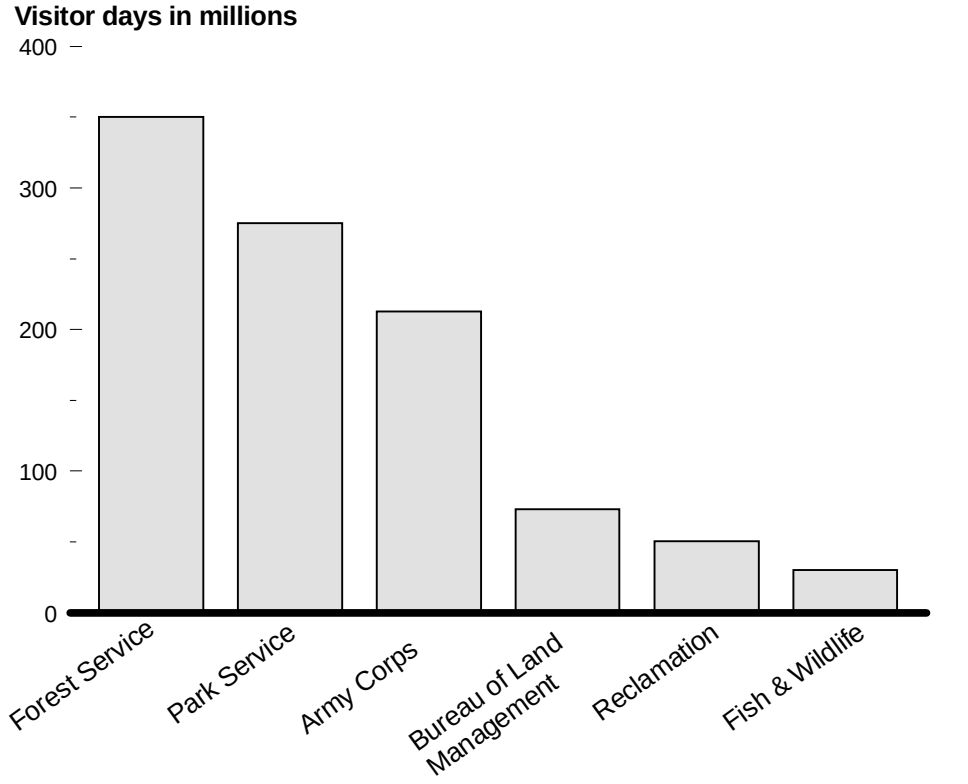
Forests in Montana. This loss of natural vegetation leaves soils vulnerable to the erosive impact of rain, which can increase the amount of sediment running off into waterbodies.

Officials we interviewed from each of the five states identified abandoned mines as significant contributors to nonpoint source pollution. In Colorado, for example, the manager of the nonpoint source unit estimated that almost 50 percent of water impairments in the state are adversely affected by acid drainage from abandoned mines. Many of these mines occur on federal lands. Several federal agencies have programs to reclaim abandoned mine sites and thereby reduce nonpoint source pollution impacts from acid mine drainage. For example, in 1997, the Forest Service obligated about $10 million for hazardous waste projects that were targeted mostly to abandoned mine land reclamation. In 1998, BLM obligated about $3 million toward abandoned mine reclamation in Colorado, Montana, and Utah.

Recreation

Officials from four of the states that we contacted as well as Forest Service, Park Service, and the Fish and Wildlife Service expressed concerns regarding nonpoint source pollution from recreation. Recreational use of public lands and waters is currently widespread and is increasing steadily. For example, in the past 10 years, recreational use of the National Forests has increased 40 percent. Figure 4.9 shows recreational use of federal lands in fiscal year 1997.

Figure 4.9: Recreational Visits to Federal Lands, by Agency



Note: Data are for fiscal year 1997 except for Reclamation, which is fiscal year 1992.

Source: Prepared by GAO using agency data.

Many recreational activities can result in direct deposits of pollutants into waterbodies such as human and pet waste. This waste may contain disease-producing bacteria and viruses and poses a potential health risk for people exposed to the water. Arizona and Oregon state officials noted that river recreation, such as tubing, kayaking, and swimming and unauthorized dumping of sewage from boats and motor homes, can cause high levels of fecal coliform in surface water. Oil and gas spills from motor boats and other recreational vehicles are also possible sources of nonpoint pollution.

Use of vehicles on public lands and roads can also cause significant erosion. As noted previously, forest roads are often left open after harvesting for other purposes such as recreational use. Forest Service research has shown that increased vehicle use causes an increase in erosion from forest roads. An estimated 1.7 million vehicles associated with recreational activities travel forest roads each day, over 10 times more than in 1950. In addition, land disturbances caused by the use of off-road vehicles can also lead to increased erosion. One BLM official told us that in extreme cases, off-road vehicle use through stream environments can cause road-beds to divert channel flows from streams onto the road surface.

State officials told us that recreational activities tend to cause water quality impairments when the activity is highly concentrated in a given area. For example, during the summer 1998, 25,000 people assembled in a small area of Apache-Sitgreaves National Forest in Arizona, causing severe land disturbances and increased erosion, as well as unusually high fecal coliform levels in otherwise-pristine forest streams. In addition, state officials said that concentrations of campers along streambanks can lead to the destruction of vegetation in riparian areas, in turn causing sediment and temperature impacts to waterbodies.

With few exceptions, federal agencies do not have specific guidance or policies for dealing with recreation and associated water quality impacts. The Park Service has a policy dealing with recreational boating and marinas and associated nonpoint sources. Some agencies perform assessments and develop solutions on a case-by-case basis once problems are identified. For example, the Park Service has recently closed some parks to off-road vehicle and jet ski use to reduce water quality problems. Likewise, BLM has designated specific off-road vehicle use areas in attempts to contain the damaging activity to small areas. However, a Forest Service research scientist told us that little federal research is available on the water quality impacts from recreation to help guide such decisions or develop strategies for dealing with recreational impacts.

Hydromodification

EPA's National Water Quality Inventory: 1996 Report to Congress identifies hydromodification activities, such as channelization and the construction and operation of dams, as contributing to the degradation of 14 percent of the nation's impaired river and stream miles. Three of the five states we contacted identified hydromodification as a significant concern, and each of the federal agencies that manage and authorize the activities—the

Bureau of Reclamation, the Army Corps of Engineers, and the Federal Energy Regulatory Commission (FERC)—acknowledged that hydromodification may contribute to nonpoint source pollution in some areas. Hydromodification projects often provide important public benefits, such as providing water to arid regions, electric power generation, or flood protection. For example, in 1992, the Bureau estimated cumulative flood control benefits of $8.4 billion in prevented damages from its projects during the period 1950 through 1992. However, state officials we interviewed noted that existing dams and channelization projects also contribute significantly to water quality impairments and can limit the extent to which streams recover from water quality degradation.

Channelization

EPA defines channelization as river and stream channel engineering undertaken for flood control, navigation, drainage improvement, or clearing away of debris. It also includes the reduction of channel migration potential—such as straightening, widening, deepening, or relocating existing channels. Levees, another form of channelization, are embankments or shaped mounds meant for flood control or hurricane protection. The Corps manages about 8,500 miles of levees nationwide to protect floodplain property without modifying the channel itself but does not maintain an inventory of the total number of channelization projects.

Managed predominantly by the Corps, federal channelization projects can contribute to nonpoint source pollution in several ways. For example, channel clearing operations remove vegetation that would otherwise act as natural barriers that slow water velocities and filter sediment and other pollutants. As a result, these operations can cause increased downstream erosion and faster rates of pollutant transport. Channel enlargement projects include activities such as increasing channel depths while retaining the original bank slopes. This may cause stream banks to slump and erode, resulting in increased loadings of sediment. Levees, when located close to streambanks, can prevent the movement of instream waters into adjacent wetlands and riparian areas. This can result in increased in-stream pollutant loadings because the natural filtration that would normally occur is prevented.

Channelization projects have caused significant declines in the quality of some watersheds. For example, state officials in Oregon reported that nonpoint source pollution problems caused by channelization projects conducted for flood control from the 1920s through the 1950s have contributed significantly to the decline of watershed functioning in the state.

Dams and Reservoirs

The Corps and the Bureau of Reclamation operate over 900 dams and reservoirs for multiple purposes such as municipal and industrial water supply, flood control, recreation, and irrigation and operate 133 hydroelectric facilities for power generation. The Bureau and the Corps are the two largest suppliers of hydroelectric power in the nation, providing about 42 billion and 75 billion kilowatt hours, respectively, and together account for almost 40 percent of total hydroelectric kilowatt hours produced. In addition, the Federal Energy Regulatory Commission regulates about 1,750 nonfederal hydropower facilities which generate about 154.5 billion kilowatt hours annually.

Dam and reservoir projects vary in size, type, and operating purpose(s) and result in water quality impacts in many different ways. Some impacts are specific to a particular type or purpose of a project, while others may occur regardless of the project type or purpose. For example, in some cases, deep reservoirs stratify by temperature, resulting in a cold, deep layer that may result in low dissolved oxygen and high concentrations of some dissolved elements such as iron, manganese, sulfur, and nitrogen. Releases from deep reservoirs can have significant temperature impacts on receiving waters; federal officials said that aquatic species can be adversely affected by these conditions if dam releases draw water primarily from this lower layer. In addition, dams and reservoirs also cause significant habitat modification problems for migrating aquatic species.[7] For example, dams can be a factor contributing to decreasing numbers in salmon populations, some of which in the Northwest are on the verge of being endangered or extinct.

Because reservoirs trap and accumulate sediment, waters released from reservoirs are often low in sediment, leaving them capable of carrying more sediment (i.e., increasing erosion) from the banks and beds of the stream immediately downstream from the reservoir. Peaking operations of dams may result in accelerated downstream erosion with the resulting increased flow rates.[8] However, in other instances, dam releases may contain high levels of sediment, which can lead to accumulation of sediment downstream as it settles out. Bureau officials told us that downstream movement of suspended sediment during extreme reservoir drawdown periods has been documented at several reservoirs, including

[7]Habitat modification includes activities in and around waterbodies that change the physical structure of aquatic ecosystems such as the locating of a dam on a river.

[8]Peaking operations, which result in larger releases of water, occur to meet a project's particular operating purpose(s), for example, responding to increases in demand for electricity, regulating water levels to minimize flooding, and maintaining certain flow levels to provide for recreation.

Island Park, American Falls, and Black Canyon in Idaho, and Thief Valley in Oregon.

The impact of individual dam and reservoir projects varies significantly, depending on the type and purpose of the project, the streamflow and sediment characteristics of the parent streams, and the management practices applied at a given site. Bureau and Corps officials told us that best management practices can be used to minimize the avoidable effects of dams on water quality. For example, older dams can be retrofitted with systems that mix water from different depths before release to minimize the thermal and dissolved oxygen impacts from stratified, deep reservoirs.

FERC also plays a role in federal nonpoint pollution by issuing licenses to nonfederal entities to construct and/or operate a hydropower project. As required by the National Environmental Policy Act, FERC must (1) prepare an environmental assessment or an environmental impact statement for any license or relicensing application and (2) describe the effects of the project on several environmental factors, including water quality. In reviewing licensing or re-licensing applications, FERC must weigh environmental impacts equally with other purposes of the project.[9] FERC can include provisions in licenses to mitigate impacts such as requirements to conduct regular water quality monitoring, to construct fish ladders to facilitate migration, or to prepare a plan to control erosion.[10]

Other Federally Managed or Authorized Activities That Can Contribute to Nonpoint Source Pollution

Several other activities managed or authorized by federal agencies were identified by state and federal officials as contributing to nonpoint source pollution in some watersheds but were not cited as significant sources of overall concern. These activities include a number of silvicultural activities other than timber harvesting and forest roads, farming, irrigation, federal-aid highways and roads, and military training.

[9]As required by the Electric Consumers Protection Act of 1986, Pub. L. No. 99-495, §3, 100 Stat. 1243, 1243 (Oct. 16, 1986).

[10]We reported in 1992 that FERC accepted a majority of resource agency recommendations in the licensing or relicensing process. Typical resource agency recommendations include minimum water flows, construction of fish passage facilities, and installation of screens to prevent injury or death to fish. See Electricity Regulation: Electric Consumers Protection Act's Effects on Licensing Hydroelectric Dams (GAO/RCED-92-246, Sept. 1992).

Other Silvicultural Practices

Silvicultural practices other than timber harvesting and forest roads primarily include site preparation, prescribed burning, and applications of chemicals such as herbicides. While no state officials we interviewed identified the practices as concerns or cited them as causes of impaired waters in their states, Forest Service officials told us that they can contribute to problems in some cases. Site preparation includes activities to help tree stands regenerate. Stands are either left to regenerate on their own or are planted. Planting can involve mechanical site preparation techniques that involves the use of heavy equipment, such as tractors, to rake the soil. This can severely disturb land surfaces and cause erosion. However, according to Forest Service officials, use of mechanical site preparation methods is declining, as the Service increasingly relies on natural regeneration.

Prescribed burning and chemical applications, which are used to maintain forest health, can also contribute to nonpoint pollution if not properly managed. For example, when a prescribed burn gets out of control, the resulting intense fire may completely burn the forest floor, exposing mineral soil and accelerating erosion in steep terrain. Applications of chemicals such as herbicides may pose a risk to water quality if applied without adequate buffers or due to drift during aerial applications. However, each of these activities are rare on federal lands. Forest Service dedicated about 1.2 million acres to prescribed burn management (less than 2 percent of total timberland) and chemically treated about 300,000 acres in fiscal year 1997.

Farming

While farming-related activity is cited as the source of a large portion of the nation's nonpoint source pollution, it is a minor contributor on federal lands. The Fish and Wildlife Service, Park Service, and the Department of Defense reported authorizing farming activity on small portions of the lands they manage. For example, farming activity is permitted by the Fish and Wildlife Service on 166,000 acres within the National Wildlife Refuge System, which constitutes less than 1 percent of the total acreage in the system. Several state officials expressed some concern regarding nonpoint source pollution resulting from federally authorized farming activity; however, they told us that impacts are not a major concern since the activity is relatively rare, especially in comparison to private farming.

Irrigation

The Bureau and the Corps both provide water resources for private farming, primarily through the construction and operation of canals,

laterals, and drains. Reclamation operates about 15,900 miles of canals, 37,000 miles of laterals, and 17,000 miles of drains to convey water for irrigation and flood control. In 1992, the Bureau provided irrigation water to private farms covering more than 9.2 million acres of western land. According to Bureau officials, return flows and runoff from irrigated lands may transport nonpoint source pollutants such as sediment, nutrients, metals, and pathogens into waterbodies.[11] Irrigation projects also contribute to salinity problems in western waters. Corps officials told us that the agency does not maintain a centralized inventory of irrigation activity because it is a small part of the Corps' mission but noted that nonpoint pollution impacts resulting from their irrigation activity are likely to be minor.

Bureau officials told us that some Bureau-managed agricultural drains are significant sources of pollution to water-quality-limited waters throughout the west, including the Snake, Boise, Payette, and Yakima Rivers. Officials from the Fish and Wildlife Service told us that nonpoint pollution impacts due to selenium drainage from irrigation return flows are among the most serious and pervasive irrigation impacts occurring on lands within the National Wildlife Refuge System. In some areas, contaminated drainwater has been linked to waterfowl deaths, birth defects, and reproductive failures. Interior has had an irrigation water quality program since 1985, which has largely focused on identifying and correcting contamination problems.

Federal-Aid Highways and Roads

Roads, highways, and bridges funded with federal dollars may also result in nonpoint source pollution. Federal aid is provided to state and local governments to construct and maintain roads and highways. Almost 1 million miles of highways and roads have been constructed and/or maintained with the aid of federal funds in the United States. While road construction can be a significant source of water pollution, most projects are regulated by EPA's stormwater permit requirements for construction sites and are therefore not discussed in this report. However, once constructed, highway operations result in nonpoint pollution via the process of stormwater runoff which carries with it any pollutants that have accumulated on road surfaces such as oil, grease, and de-icing compounds.

[11]It is important to note that irrigation return flows—while a discrete conveyance of pollution to a waterbody—were specifically exempted from point source control in the Clean Water Act, and we have, therefore, included this category in our discussion of nonpoint sources.

The Department of Transportation has compiled research that provides guidance to state and local governments for mitigating water quality impacts from roads, highways, and bridges. Best management practices to control this type of runoff include structures such as filters, trenches, and ponds designed to trap nonpoint source pollutants, minimizing the amount that actually reaches waterways. However, because road and highway projects are decentralized, mainly carried out by state and local governments, the Department does not have nationwide data on the implementation of these management practices (although implementation of such activities is typically a requirement for receiving federal aid).

Military Training

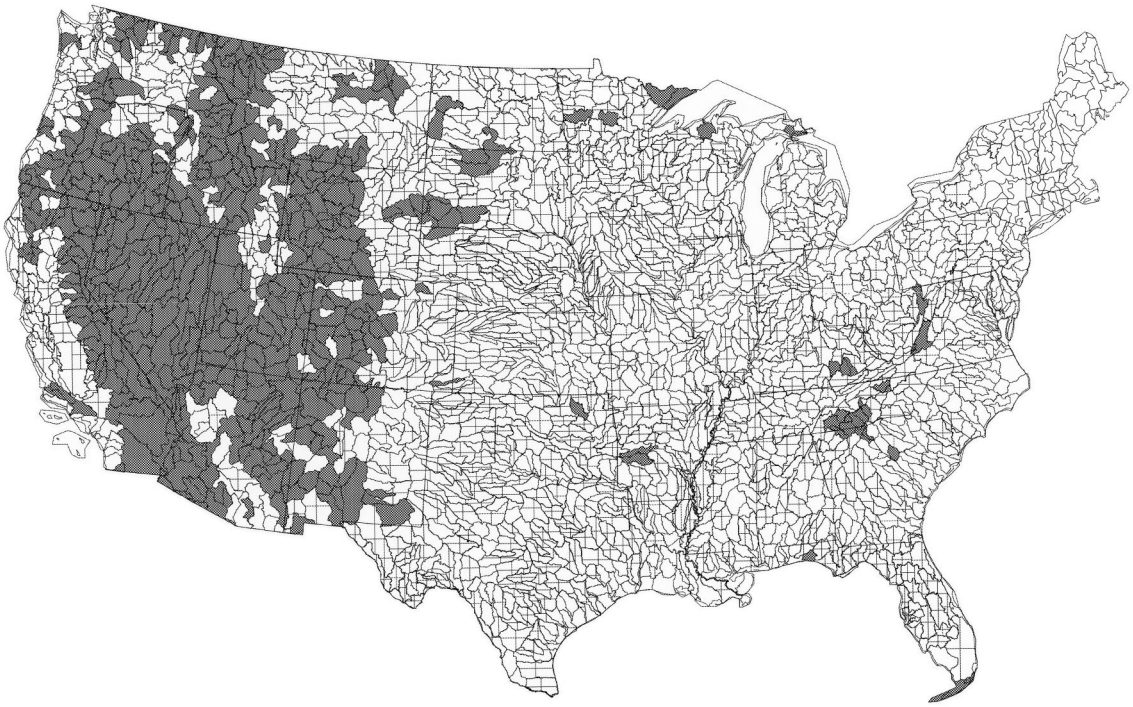
The major sources of nonpoint pollution identified by Defense officials are associated with maneuver bases and training areas, especially from the use of heavy vehicles and machinery such as tanks, artillery pieces, and amphibious assault vehicles, as well as from large caliber firing ranges. These activities can result in significant land disturbances and subsequent erosion following large storms. Service officials we talked with said that impacts do occur, and in some cases, water quality standards have been violated. For example, Marine Corps staff have observed severely eroded roads and vehicle crossings over streams at Camp Lejeune in North Carolina and Quantico in Virginia. In addition, Army officials told us that erosion is a serious problem for many Army maneuver bases located on abandoned or degraded agricultural land where soils are highly erodible, especially on eastern bases such as Fort Bragg, North Carolina.

Service officials said that minimizing nonpoint source impacts is in their best interest in order to avoid violations of state water quality standards and to enable them to continue their critical training missions. For example, while all of the military services expressed some concern with metals leaching from ammunition used on firing ranges, lead in stormwater runoff has rarely been documented. In response to a contaminated runoff incident, the Marine Corps built traps to collect bullets to avoid any further leaching, even though water quality had not been impaired. Collected bullets can then be recycled, which allows for recovery of the cost of the traps. In addition, as discussed in chapter 2, some nonpoint sources are addressed via Defense's stormwater permit activities by diverting nonpoint runoff and treating it as a point source.

The Federal Contribution to Nonpoint Source Pollution May Be Significant in Many Western Watersheds

The predominance of federal land ownership in many western watersheds suggests a potentially significant federal contribution to nonpoint source pollution in those areas. Overall, federal lands account for about 20 percent of the total land surface area in the lower 48 states. Most of this land is in 11 Western States—Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. As indicated in figure 4.10, tracts of federal land can encompass large portions of many watersheds (shaded areas represent watersheds with greater than 50 percent of the land owned by the federal government). Specifically, federal agencies own at least one-half of the land area in about 60 percent of the watersheds in the above 11 states and 22 percent nationwide.

Figure 4.10: Watersheds in Which Land Owned by the Federal Government Exceeds 50 Percent



Source: USGS.

The nonpoint source program managers that we contacted in five of the Western States reported many water quality problems resulting from one or more of the federal activities discussed in this chapter. In Oregon, for example, the manager of the nonpoint source program told us that nonpoint source pollution from federal activities is the primary source of impairment of 50 to 60 percent of the waterbodies the state reported as impaired. In Arizona, the nonpoint program manager said that federal activities are the primary source of impairment to almost 50 percent of all impaired waters in the state. Several state officials pointed out, however, that not all water quality impacts are due to current federal activities citing past timber and grazing practices, in particular, as sources of continuing nonpoint pollution in their states.

Even in watersheds where there is not significant federal land ownership or a significant federal contribution to nonpoint source pollution, control of nonpoint source pollution by federal agencies may promote strong federal stewardship of lands held in the public trust and encourage strong stewardship by private landholders. EPA officials in the interagency Chesapeake Bay Program told us that even though federal agencies own just a small percent of the land in the Bay watershed, they have enjoyed broad federal involvement in restoration activities, which has helped to promote federal stewardship of public lands and set an example for private landholders. In November 1998, EPA and its federal partners announced a new commitment to this stewardship, recognizing the important role the agencies can play in the Bay watershed.

State environmental efforts can benefit from such stewardship as the manager of the nonpoint source program in Oregon pointed out to us. He said that weak federal commitment to addressing nonpoint pollution discourages private stewardship. On the other hand, he noted that strong federal stewardship of public lands can encourage private stewardship by demonstrating commitment and accomplishments. In addition, each of the five state officials we contacted noted that they had good working relationships with several of the federal agencies discussed in this report and, in these instances, were working with their federal counterparts to address water quality impacts.

The Clean Water Action Plan acknowledges the importance of the federal contribution to nonpoint source pollution, outlining several key action items federal agencies are to implement in order to better protect water resources on federal land. Specifically, USDA and Interior are to lead the development of a unified federal policy to enhance watershed

management on federal lands to provide for the protection of water quality and health of aquatic systems. In addition, federal agencies are to ensure that environmental safeguards and appropriate water quality provisions are included in permits, licenses, and other agreements used to allow activities to occur on their lands.

Agency Comments

The Department of the Interior said that the draft report appeared to equate the magnitude of nonpoint source pollution to the amount of federally managed land involved. The Forest Service expressed a similar concern, noting that simply because a significant portion of the land base in many Western States is federally managed, it does not necessarily follow that these lands contribute a significant proportion of the nonpoint source pollution in these states. The Service suggests characterizing the federal contributions as "potential" rather than "actual." As discussed in chapter 4, information obtained from the states we contacted does in fact show that a significant proportion of water quality problems can be attributed, at least in part, to activities occurring on federal land. However, we acknowledge the variability in this relationship, noting that the degree of pollution in specific areas may depend on site-specific characteristics such as geographic and hydrologic conditions, the type of activities occurring and intensity of use, and management practices applied to minimize impacts. Accordingly, as suggested by the Forest Service, we modified language in chapter 4 where appropriate to characterize the association between a large portion of federally owned land to contributing a significant amount of nonpoint pollution as potential rather than actual.

On a related issue, USDA's Natural Resources Conservation Service said that chapter 4 leaves the impression that all grazing and timber activities cause nonpoint source pollution and suggested that the activities in this chapter should be characterized as contributing to nonpoint source pollution only if not properly managed. We agree that water quality impacts can be reduced, but not necessarily eliminated, by the use of appropriate management practices and discuss some of these practices in each of the activity sections. However, such practices may not always be in place. Moreover, as pointed out by federal and state officials, as well as by Forest Service research—and included in our report—water quality impacts continue to result from past management practices, such as the type of heavy grazing that occurred in the late 1800s and certain timber harvesting practices.

FERC acknowledged that nonpoint source pollution-related impacts can result from FERC-licensed hydropower projects, but cautioned that in characterizing these impacts, the report (1) carefully distinguish between the effects of hydropower versus other forms of hydromodification; (2) distinguish between FERC-licensed projects and federally managed projects; and (3) recognize that hydropower is not an original source of some of the impacts identified, but rather a factor that can amplify the effects of other sources that contribute nonpoint pollution. Regarding the first two points, while our draft did in fact recognize the distinctions identified by FERC, we made additional changes to add further clarification. Regarding the third point, we agree that, in some instances, hydropower is not technically the source of the pollution, although, as FERC points out, it may still be a contributor. In other instances, however (such as situations where changes in temperature or dissolved oxygen levels or increased downstream erosion result directly from a project's operations), we continue to believe that it is more appropriate to characterize the project as an original source of the pollution.

Other Clean Water Act Sections Addressing Nonpoint Pollution

In addition to the Environmental Protection Agency (EPA) programs discussed in this report that primarily address nonpoint source pollution, a few other programs authorized by the Clean Water Act address nonpoint source pollution but to a lesser extent. This appendix provides an overall description, funding levels, and allocation methods for these remaining programs.

- Section 104(b)(3): National Wetlands Program ($620,000 obligated for nonpoint activities out of $70 million appropriated to the program for fiscal years 1994 though 1998.)

  Overall Objective: The program's overall objective is to protect, manage, and restore the nation's wetland resources consistent with EPA's Clean Water Act responsibilities and to assist state, local, and tribal governments in developing effective wetland programs. According to EPA, a program objective is also to encourage and enable others to act effectively in protecting and restoring the nation's wetlands and associated ecosystems, including shallow open waters and free-flowing streams. EPA's activities are predominantly establishing national standards and assisting others in meeting those standards.

  Allocation Method: EPA uses a competitive process to allocate program funds to state, local, and tribal governments and to interstate and intertribal entities. EPA headquarters releases yearly guidance that describes the grant program and establishes program direction and priorities. EPA's regional offices review all proposals and select projects that best help develop or refine wetland protection, management, or restoration programs.

- Section 106: EPA's Water Pollution Control, State and Interstate Program Support Program ($2.3 million obligated for nonpoint activities out of $418.3 million appropriated to the program for fiscal years 1994 through 1998.)

  Overall Objective: This program was created to assist states, territories, interstate agencies, and qualified Indian tribes in establishing and maintaining adequate measures for preventing and controlling surface and ground water pollution. Grant funds provide broad support for the prevention and abatement of surface and ground water pollution from point and nonpoint sources through activities such as water quality planning, standard setting, permitting sources, monitoring, and assessments and enforcement.

Allocation Method: EPA uses a formula to allocate program funds to states, interstate agencies, and tribes. Developed in 1974, the formula is primarily based on state population and four categories of point source pollution (municipal dischargers, industrial dischargers, feedlots of 1,000 head or greater, and power plants). EPA has proposed a revision of the formula to be more reflective of current water quality impairment.[1]

- Section 314: Clean Lakes Program ($950,000 obligated for nonpoint activities out of $5.06 million appropriated to the program for fiscal years 1994 through 1998.)

  Overall Objective: The overall objective of this program is to provide financial and technical assistance to states to restore and protect publicly owned lakes and reservoirs. The program has evolved considerably over time. The program's early focus was on research and the development of lake restoration techniques and evaluation of lake conditions. In the 1980s, attention was shifted to identifying sources of pollution and developing plans to deal with water quality problems. EPA has not requested funds for this program in recent years because the agency encouraged states in its May 1996 National Nonpoint Source Program guidance to use section 319 moneys to fund eligible activities that might have been funded in previous years under section 314. About $16.6 million of section 319 funds have been used to perform lake and reservoir work.

  Allocation Method: Under this program, EPA uses a formula, a competitive process, and other processes to allocate funds to states. EPA used a formula to allocate a portion of the appropriated section 314 funds to each of its regions, taking into account several factors such as the number of states per region, number of lakes/reservoirs, land use, and nonpoint pollution problems. Each region then awarded its portion of the funds on a competitive basis. In addition, the Congress may include funding to a specific lake project as a separate line item in the budget.

- Section 320: National Estuary Program (EPA did not report nonpoint source-related obligations for this section, noting that the program does not specifically focus on nonpoint pollution and therefore does not track obligations in that way—total appropriated funding was $60.3 million for fiscal years 1994 through 1998.)

[1]EPA is considering delaying the implementation of the new formula in response to concerns that it places too much emphasis on reducing runoff from nonpoint source pollution, which some claim will favor agricultural states in the Midwest and West while reducing funds for the Northeast and parts of the South.

Overall Objective: The National Estuary Program's overall objective is the attainment or maintenance of water quality in the nation's estuaries to ensure protection of public water supplies and the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife. The program is designed to encourage local communities to take responsibility for managing their estuaries by encouraging stakeholders, including federal, state, and local government agencies, citizens, business leaders, educators, and researchers, to (1) work together to identify problems in the estuary, (2) develop specific actions to address those problems, and (3) create and implement formal management plans.

Allocation Method: EPA recently revised its formula for allocating program funds to state and local governments, nonprofit organizations, and regional planning organizations. Initially, EPA created size distinctions and provided higher levels of funding for large estuary projects. This size distinction was phased out in fiscal year 1998 because experience with older programs revealed that small estuaries can be just as complex as large estuaries depending on such things as priority problems, the current state of knowledge of the estuary, and cultural diversity. In addition, EPA created a staged funding approach: programs developing a Comprehensive Conservation and Management Plan for the estuary received more funding than programs in plan implementation. Every year, EPA develops specific funding guidance that explains how funds will be allocated.

Non-EPA Federal Programs That Address Nonpoint Source Pollution

Dollars in millions

Title	FY 1994-1998 obligations for nonpoint[a] (total appropriated)	FY 1998 obligations for nonpoint	Objectives
Department of Agriculture			
Natural Resources Conservation Service			
Environmental Quality Incentives Program[b,c]	$642 ($530)	$232	To provide flexible technical, educational, and financial assistance to producers that face the most serious threats to soil, water, and related natural resources.
Watershed Protection and Flood Prevention	$433.26 ($585.41)	$80.83	To cooperate with state and local agencies in planning and carrying out work to improve soil conservation and for other purposes—such as flood prevention, and the conservation, development, and utilization of water.
National Resources Inventory	$70.5 ($94)	$21.68	To provide statistically valid information for agricultural and environmental program and policy development, implementation, and evaluation.
Great Plains Conservation Program[b]	$45.99 ($40.7)	$3.89	To maintain soil and water resources in the 10 Great Plains States by installing corrective practices. Consolidated into EQIP in 1996.
Colorado River Basin Salinity Control Program[b]	$31.9 ($20.96)	$5.52	To reduce the amount of salt loading to the Colorado River from surface runoff and subsurface percolation of irrigation water that carries the salt in solution to the river. Consolidated into EQIP in 1996.
Wetland Reserve Program[c]	$549.8 (549.8)	$218.6	To protect, restore, and enhance the functions and values of wetland ecosytems.
Highly Erodible Land and Wetland Conservation Compliance[d]			To remove certain incentives for persons to produce agricultural commodities on highly erodible land or converted wetland.
Farm Service Agency			
Conservation Reserve Program[c] (includes the Conservation Reserve Enhancement Program)	$9,193.6 ($8,700)	$1,710.89	To cost effectively reduce water and wind erosion, protect the nation's long-term capability to produce food and fiber, reduce sedimentation, improve water quality, create and enhance wildlife habitat, and encourage more permanent conservation practices and tree planting.
Agricultural Conservation Program[b] (includes Water Quality Incentives Projects)	$462.63 ($369.65)	$12.29	To help prevent soil erosion and water pollution, protect and improve productive farm and ranch land, conserve water used in agriculture, preserve and develop wildlife habitat, and encourage energy conservation measures. Consolidated into EQIP in 1996.
Emergency Conservation Program	$218.63 ($207.0)	$35.68	To rehabilitate farm land damaged by natural disaster and to carry out emergency water conservation measures during periods of severe drought.
Cooperative State Research, Education, and Extension Service			

(continued)

Dollars in millions

Title	FY 1994-1998 obligations for nonpoint[a] (total appropriated)	FY 1998 obligations for nonpoint	Objectives
National Research Initiative Competitive Grants Program	$28.84 ($456.3)	$5.19	To increase the quantity and quality of science applied to the needs of agriculture and forestry.
Water Quality Program/ Education, Technical, and Financial Assistance	$39.4 ($26.9)	$5.7	To provide educational and technical assistance programs for voluntary farmer adoption of improved management practices to enhance or protect water quality.
Water Quality Program/ Research and Development	$20.38 ($20.38)	$2.46	To measure the impact of farming systems on water quality, identify processes that control fate and transport of chemicals and other contaminants, and determine social and economic impacts of alternative management systems.
Rural Clean Water Program[e]	$.094 (0)	$.006	To address agricultural nonpoint source pollution problems in watersheds.
Forest Service			
Watershed Research Program (formerly the Watershed Management and Rehabilitation Program)	$69.46 ($69.46)	$11.30	To conduct long-term studies of the effects of natural events and land management activities on water quality, quantity and timing to provide a scientific basis for land managers' efforts to protect and restore watershed and riparian ecosystems.
Agricultural Research Service			
Water Quality/ Research, Development, Information	$273.8 ($273.8)	$59.2	To measure the impact of farming/ranching practices and systems on water quality; identify processes that control fate and transport of chemical and other contaminants; develop cost-effective, alternative farming/ ranching practices and systems for all nonpoint source contaminants including salts, toxic trace elements, nutrients, pesticides, pathogens, and other waterborne diseases; deliver technologies, models, decision support systems, and management information to enhance or protect water quality.
Department of the Interior			
Fish and Wildlife Service			
Partners for Fish and Wildlife	$97.87 ($97.87)	$24.36	To restore habitat for federal trust species through voluntary agreements with private landowners.
Off-Refuge Investigations	$4.18 ($5.58)	$0.86	To protect and enhance the quality of the habitat and environment on which fish and wildlife trust resources depend, and provide recommendations and support state and other federal agencies in implementing management actions to resolve contaminant problems.

(continued)

Dollars in millions

Title	FY 1994-1998 obligations for nonpoint[a] (total appropriated)	FY 1998 obligations for nonpoint	Objectives
On-Refuge Investigations	$7.13 ($9.5)	$1.4	To protect and enhance the quality of the habitat and environment on which fish and wildlife trust resources depend, and provide recommendations and support refuge managers in implementing management actions to resolve contaminant problems.
Clean Vessel Act Pumpout Grant Program	$40 ($40)	0	To install pumpout stations for the removal of sewage from boats with holding tanks and portable toilets and to educate boaters on the need for using pumpout and dump stations and where these facilities are located.
Oil Spill Response[e]	$2.2 (0)	$0.30	To minimize injuries to Fish and Wildlife-managed resources.
Bureau of Land Management			
Soil, Water, Air Management	$48.96 ($91.50)	$13.41	To provide for the protection of watershed values (such as soil stability) and air quality on the public lands; reduce salinity and runoff from the public lands to protect water quality; provide for the legal availability of water on public lands; provide information for public lands, watersheds, and air resources; and support BLM's "Riparian Wetlands Initiative."
Rangeland Management	$132.04 ($248)	$32.61	To manage public rangelands to ensure their long-term health, natural diversity, and productivity.
Riparian Management	$39.24 ($73.58)	$9.88	To enhance riparian/aquatic habitat to improve water quality and to complete the proper functioning assessments of natural indicators and characteristics of riparian areas in the lower 48 states by implementing the "Clean Water and Watershed Restoration Initiative."
Oregon and California Grant Lands and Other Resources	$76.30 ($143.44)	$17.64	To manage the following types of resources (excludes forest management): recreation; wildlife habitat and fisheries; soil, water, and air; and rangeland. This program is a portion of a larger activity to manage resources on Oregon and California grant lands in western Oregon.
USGS			
National Water Quality Assessment Program	$255.69 ($300.81)	$54.58	To identify the status and trends in water quality conditions for major water resource areas (surface and groundwater) and the human and natural conditions that cause existing water quality conditions; and communicate findings to resource managers and policy makers.
National Trends Network	$15.09 ($8.75)	$2.99	To provide a nationwide, long-term record of spatial and temporal trends in atmospheric deposition.
Office of Surface Mining			

(continued)

Dollars in millions

Title	FY 1994-1998 obligations for nonpoint[a] (total appropriated)	FY 1998 obligations for nonpoint	Objectives
Abandoned Mine Land Program	$626.26 ($695.85)	$128.09	To restore lands mined and abandoned or left inadequately reclaimed prior to Aug. 3, 1977, thereby protecting society and the environment from the adverse effects of surface coal mining operations.
Clean Streams Initiative	$6.52 ($6.52)	$2.52	To clean streams and rivers polluted by acid and toxic drainage form abandoned coal mines.
Bureau of Reclamation			
Colorado River Basin Salinity Control Program	$85.53 ($85.53)	$15.52	To prevent any further degradation of the Colorado River and limit damages.
NOAA			
Coastal Nonpoint Pollution Control Program	$12.02 ($10.0)	$2.24	To protect and restore coastal waters and help states establish enforceable programs for comprehensively addressing the most significant sources of nonpoint pollution.
Coastal Zone Management Program	$23.81 ($229.1)	$5.15	To encourage states to manage their coastal land and water resources.
Department of Defense-Army			
Integrated Training Area Management Program[f]	$50.35 ($95.12)	$20.34	To maintain and sustain training lands. These actions indirectly contribute towards preventing nonpoint source pollution.

(Table notes on next page)

Note: Programs included are those identified by the agencies surveyed that met at least one of the following criteria: (1) expenditures addressing nonpoint source pollution exceeded $10 million for at least 1 year during fiscal years 1994 through 1998 or (2) program activities primarily addressed nonpoint source pollution regardless of program expenditures. Some reported programs do not have specific nonpoint source pollution objectives but address the problem through other objectives.

[a]Obligations for nonpoint activities may include an estimated dollar amount for full-time staff over and above appropriated funds, if reported by the agency. In some cases, this may result in the total amount devoted to addressing nonpoint source pollution to be greater than the appropriated amount.

[b]The Environmental Quality Incentives Program combines several of USDA's conservation programs—the Agricultural Conservation Program (including Water Quality Incentives Projects), the Colorado River Basin Salinity Control Program, and the Great Plains Conservation Program. These programs received partial appropriated funding in fiscal year 1996 before being consolidated. In addition, some of these programs had outlays in later years in order to service prior year contracts.

[c]The Environmental Quality Incentives Program and the Conservation Reserve Program do not receive appropriations. These programs are funded through the Commodity Credit Corporation. The Wetland Reserve Program began receiving funds through the Commodity Credit Corporation for fiscal year 1997.

[d]USDA did not provide dollar amounts for this program. Instead, USDA identified 4,720 full time equivalents out of a total of 11,800 that could be considered as helping to reduce nonpoint source pollution.

[e]No funds were appropriated to this program during this period. Funds used to address nonpoint pollution were entirely from full-time staff equivalents.

[f]DOD only reported obligations for this program for fiscal years 1996 through 1998. According to the Department, prior to this, the program was managed by a different office, and expenditures were not tracked in a way that allowed for separating funding obligated for nonpoint source-related activities.

Comments From the Department of Agriculture and Our Evaluation

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20250

JAN 29 1999

Mr. David G. Wood
Associate Director
Environmental Protection Issues
General Accounting Office
Washington, D.C. 20548

Dear Mr. Wood:

In response to your request of January 4, 1999, enclosed are comments of Department of Agriculture agencies with programs that address nonpoint source pollution control. The comments refer to your draft report, "Water Quality: Federal Role in Addressing -- And Contributing To -- Nonpoint Source Pollution."

If you should have questions, please contact Lee Bensey, Director, Operations Management and Oversight Division, Natural Resources Conservation Service, at (202) 720-8388.

Sincerely,

Gloria Hunniston for

James R. Lyons
Under Secretary
Natural Resources and Environment

Enclosure

USDA AGENCY COMMENTS ON U.S. GENERAL ACCOUNTING OFFICE DRAFT REPORT NUMBER RCED-99-45

"WATER QUALITY: Federal Role in Addressing, -- and Contributing to -- Nonpoint Source Pollution

Natural Resources Conservation Service (NRCS)

- Page 3, 2nd paragraph, last sentence - Change "some federal" to Department of Agriculture (USDA).

Now on p. 3.
See comment 1.

- Page 4, 1st paragraph under Results in Brief: This paragraph is misleading. In the last sentence, it states that USDA spends over $11 billion, or almost 80 percent of the Federal funds identified for nonpoint source pollution. This figure includes 100 percent of the Conservation Reserve Program (CRP), which has no specific nonpoint source objectives. If this paragraph is to be used in this report, the information on page 34 (last paragraph), which explains that CRP is included in this figure, needs to be included in the Executive Summary.

See comment 2.

- Page 5, last sentence: This sentence is misleading. How much of the problems are affected by Federal lands: 0.05 percent, 20 percent, 90 percent? As stated, the reader cannot determine the true amount of Federal involvement in contributing to the nonpoint pollution to State waters.

- Page 6, last paragraph, 2nd sentence: Edit to read "USDA in particular ... with reducing nonpoint pollution from privately owned land, which comprises approximately 70 percent of the contiguous United States."

Now on p. 6.

See comment 3.

- Page 7: Revise the text so that it becomes clear that water quality is NOT the sole purpose of the funding for the Environmental Quality Incentives Program (EQIP) and CRP and that the environmental benefits can include water quality, but in many places wildlife habitat and other benefits are primary. There may not even be a water quality concern in some funded locations or sites. It is an injustice to leave this assumption in the first few pages of the document.

Now on p. 18.

- Page 15, 2nd sentence: Edit to read "This results in pollutants, either dissolved or solid, being transported... into groundwater."

Now on p. 19.

See comment 4.

- Page 16, Figure 1.1, Item J, "Roads, highways, bridges: Roads, highways, and bridges create additional nonpervious surfaces which increase runoff, flood potential, and sediment loads within the stream/river caused from erosion around bridge abutments. We suggest that you add an "Item K" that would include "all vehicle traffic" - these obviously are a source of gas emissions, metals, oil, and other contaminants that find their way into the aquatic ecosystem.

Now on p. 19.

- Page 17, 1st paragraph, 2nd sentence: Edit to read "Another ... plant growth and subsequent decaying organic matter that depletes ... aquatic life."

Now on p. 21.

- Page 18, 2nd paragraph, 2nd sentence: Edit to read "For example, ... cost-share approach with private landowners to encourage... practices."

See comment 5.

- Page 33, Figure 2.4: This graphic is misleading because all of the funds spent on CRP are included as nonpoint pollution funds when this is not the main objective of the program.

- Page 34, 2nd paragraph, 2nd sentence, (2): Edit to read " (2) a continuous ... provide shade, food sources, and shelter, for fish and other wildlife)." Also, remove the word "our" from sentence (2) so that it reads "..... that filter pollutants from runoff... wildlife)."

See comment 6.

- Page 35, 3rd paragraph: Adjust the text to show that the primary difference between CRP and EQIP includes the concepts of cost share and incentives vs. land retirement. Furthermore, to say that all the funds went to nonpoint source may be stretching it, since some of the areas do not have enough rainfall to have runoff or be a source.

See comment 7.

- Page 35, 1st paragraph under EQIP: EQIP is not a nonpoint source reduction program. It should not be stated that it is, nor should it be stated that the program makes long-term conservation contracts .... to improve the environmental health of the Nation's farm and ranch land and reduce nonpoint source pollution. Rather, use language from the final rule.

See comment 8.

- Page 36 and Appendix II: The draft report cites and lists USDA programs, which address nonpoint source water quality problems. However, there is no reference to the contributions made by the Wetland Reserve Program (WRP) or the Forestry Incentives Program (FIP). Since both programs are cited in the Clean Water Action Plan (CWAP) as contributing to addressing clean water issues, perhaps these programs ought to be listed in and accounted for in this document.

- Page 44: The terminology "small concentrated animal feeding operations" is used. The draft USDA Environmental Protection Agency (EPA) Unified National Strategy for Animal Feeding Operations differentiates between animal feeding operations (AFO's) and concentrated animal feeding operations (CAFO's). It is suggested that the General Accounting Office (GAO) use the terminology AFO, in place of "small concentrated animal feeding operations."

Now on p. 49.

- Page 52, 3rd paragraph, 2nd sentence: Edit to read "The amount of ... depending on factors like soil type, slope, duration, and intensity ... aquifer."

Now on p. 54. See comment 9.

- Page 56, 2nd heading: Rewrite to be "Federal Activities that could contribute to nonpoint source pollution if not managed properly." The impression is left that all grazing and timber activities cause nonpoint source pollution. The word "significant" should definitely be removed from this heading.

Now on p. 61. See comment 10.

- Page 65, 1st paragraph, last sentence: We do not believe this statement. Thirty percent of all impaired waters in the state of Oregon are due to grazing? The report needs to show some data to back up statements like this.

Now on p. 67.

- Page 71, 1st paragraph: Add one last sentence to read, "Oil and gas spills from motor boats and other recreational vehicles are also sources for potential nonpoint source water quality contamination."

Now on p. 83. See comment 11.

- Page 87, Appendix II: - This table is titled "Non-EPA Federal Programs that Primarily Address Nonpoint Source Pollution." The table includes the Watershed Protection and Flood Prevention Program and the National Resources Inventory programs. These programs are not primarily for addressing nonpoint pollution nor is it a collateral benefit of them.

Agricultural Research Service (ARS)

See comment 12.

- The report does not specifically address the limitations in scientific knowledge that may be partly responsible for the limited progress that has been made in addressing the broad spectrum of water quality problems impacted by nonpoint source contaminants. The specific types of water quality problems being addressed by researchers today are significantly different than those addressed 10 to 20 years ago.

- The EPA estimated costs of controlling selected nonpoint sources of pollution will also be affected by the availability and cost-effectiveness of alternative farming practices and systems, and by market-driven changes that may take place in food and fiber production systems, such as the recent growth in more intensive livestock operations. This should lead EPA and other agencies to understand the importance of newer technologies and management solutions to water quality problems and challenges.

- ARS is supportive of the report's recommendation that a watershed approach be used to determine both the effectiveness of water quality protection measures and estimated cost of controlling nonpoint sources of pollution. ARS research has established that the protection provided by natural barriers, such as riparian zones, is watershed specific. In addition, the effectiveness of using specific practices to control the movement of potential contaminants can be markedly affected by site conditions. However, it should be noted that multi-facet technologies and management solutions are needed to address site-specific problems at the field and watershed scale.

Water Quality 4

- There is also increasing evidence that not all parts of heterogeneous landscapes and watersheds are equally vulnerable to the movement of nonpoint source contaminants. While the concern expressed in this report, that resource shortages are constraining EPA from moving to a watershed approach, may well be justified, an optimal approach to controlling nonpoint source pollution will require the use of a scientifically defensible operational strategy.

- There appears to be some inconsistency in the type of program and funding information included in Appendix II. The research programs of the Cooperative State Research, Education, and Extension Service (CSREES) and the Forest Service are included, but other research programs are not. If information is needed on the research program of ARS that contributes to the development of technologies and farming systems for controlling nonpoint source pollution, the details are provided as an attachment.

See comment 13.

- ARS shares the concern expressed in the report that the EPA estimated cost of controlling nonpoint sources of pollution does not include the operational costs associated with the use of best management practices and alternative farming systems. Closer interaction among all agencies with responsibilities for developing and promoting the use of best management practices and alternative farming systems will need to be encouraged. Again, the best management practices and alternative farming systems need to be scientifically based and site specific in terms of both regulatory and voluntary approaches.

- Incorporate the following information for the Agricultural Research Service into the report's APPENDIX II: NON-EPA PROGRAMS THAT PRIMARILY ADDRESS NONPOINT SOURCE POLLUTION

See comment 14.

Title	FY 1994-98 obligations for nonpoint (total appropriated)	FY 1998 obligations for nonpoint	Objectives
Agricultural Research Service			
Water Quality/ Research, Development, Information	$273.8 million ($273.8 million)	$59.2 million	To measure the impact of farming / ranching practices and systems on water quality; identify processes that control fate and transport of chemicals and other contaminants; develop cost-effective, alternative farming / ranching practices and systems for all nonpoint source contaminants including salts, toxic trace elements, nutrients, pesticides, pathogens, and other waterborne diseases; deliver technologies, models, decision support systems, and management information to enhance or protect water quality.

Farm Service Agency

No comments.

Forest Service (FS)

Now on pp. 8 and 75. See comment 15.

- Pages 11 and 80: This section suggests that because Federal lands represent a significant portion of the land base in many Western States, they must also cause a significant proportion of the pollution from nonpoint sources. We do not believe that this is a valid conclusion and lands should be mentioned in terms of potential pollution, rather than actual pollution. For example, soil and water conservation practices, or Best Management Practices, are prescribed for all Forest Service projects to minimize nonpoint source pollution from management activities. In addition, the amount of land affected by National Forest silvicultural activities is declining. During fiscal year (FY) 1997, only 458,000 acres of National Forest land were impacted by some type of timber harvesting activity, much of this being thinning or single tree selection. This represents only 0.93 percent of the suitable timber base, 0.54 percent of all timberland, and 0.33 percent of all forest land.

See comment 16.

Now on p. 61.

- Page 65: The Forest Service has monitored fecal coliform in water draining from some of its range allotments in South Dakota and has been unable to identify grazing as the significant cause of nonpoint source pollution for bacteria. We are finding wildlife to be an increasing cause of sedimentation that persists even after domestic livestock are removed from the grazing allotment.

Now on p. 84.
See comment 17.

- Page 89: In the section presenting non-EPA Federal Programs that primarily address nonpoint source pollution, the only item reported is our Watershed Research Program. It is important to understand that a portion of our budget is in support of nonpoint source pollution control. It is budgeted in a different manner. Instead of a line item, the control of nonpoint source pollution is the responsibility of each resource program manager.

Cooperative State Research, Education, and Extension Service

See comment 18.

The draft report focuses on the Federal role in addressing and contributing to nonpoint source (NPS) pollution. It concentrates on implementation programs that address NPS pollution with very little attention to research on NPS pollution. CSREES and the NRI only are mentioned in passing. This is an interesting characteristic of a report that comments only in passing on the research and/or research needs associated with NPS pollution. For example, of the $1.9 billion in spending reported by the USDA for FY 1998, only $5 million (that is 0.26 percent of USDA's spending) was reported as being spent to: improve our understanding of the causes and effects of NPS pollution; improve our understanding of the processes that control transport and fate of NPS pollutants; or develop better management approaches for the reduction of NPS pollution.

See comment 19.

An associate, but critical, point revolves around the issue of coordination between scientists from EPA and those from other agencies. We strongly encourage USDA to identify representatives from the FS, CSREES, ARS, and NRCS to participate in this coordination. Among these agencies, NRCS is the only agency clearly identified in the report and yet NRCS is the only agency without a defined research mission. It is imperative that implementation of NPS pollution programs be founded in fundamental science.

See comment 20.

A second point that needs to be addressed is the diversity of issues that lead to NPS pollution aside from agriculture. While it is clear that agriculture is responsible for much of NPS pollution, urban/suburban development pressures are imposing a greater impact as development consumes historically agricultural environments. It is not appropriate to use State 319 reports as the basis for estimates of the proportion of surface waters impaired by NPS pollution. Not all of the State-run programs base their estimates on the full population of surface waters within their borders. Instead, they use a selected sample population where they **expect** to find impairments. The GAO report should examine such biased practices more carefully.

See comment 21.

A third critical point is that the GAO report highlights the CWAP as a key means to further address NPS pollution issues. In this discussion of the Plan, more consideration should be given to the "status quo" bias that is perpetuated throughout the Plan's recommendations. There are two glaring weaknesses in this approach: 1) it makes the implicit assumption that we already know when, where, and how to best resolve our water quality impairment problems and that the implementation of existing improvement options is all that is needed: and 2) it makes the implicit assumption that because we have in the past been able to improve our water quality, the management strategies used to date will continue to work in the future and will always serve our needs. Both of these assumptions are highly questionable.

The CWAP contains no provision calling for the support of basic research or for an examination of comparative processes as represented in water quality prediction models used across multiple spatial scales. **It is recommended that the plan be revised to direct (at a minimum) 10 percent of future CWAP spending to basic and applied research on processes affecting water quality at the watershed and landscape scales**.

The CWAP also contains no provision for any means to evaluate the performance of the various water quality improvement programs, nor does it call for any efforts to better characterize source area relationships at the watershed and landscape scales. **It is recommended that the plan be revised to direct (at a minimum) 25 percent of future CWAP spending to watershed-scale monitoring both as a method of performance evaluation, source-area determination, and as a base data set for landscape-scale research and model improvement**.

Finally, assessments of agricultural contributions to NPS pollution assume a known background level for sediment and other contaminants in water bodies. We do not believe that there is consensus among scientists as to the level and variability of these background contributions. We need to better understand these background contributions and their variability in order to assess the impacts of management activities on the quality of water resources.

The following are GAO's comments on the Department of Agriculture's (USDA) letter dated January 29, 1999. Several of USDA's services provided clarifications and technical points that were incorporated into the report as appropriate. Within the letter, there are 21 points on which we provide the following comments.

1. The Natural Resources Conservation Service (NRCS) said that the information in the executive summary indicating that USDA programs represent almost 80 percent of the funding identified for nonpoint source pollution is misleading because, as the draft points out later, its largest program—the Conservation Reserve Program—has no specific nonpoint source objectives. NRCS suggested that certain information in the body of the report be reflected in the executive summary to clarify that while activities under the program do in fact address nonpoint source pollution, nonpoint source pollution control is not a stated objective of the program. We have made these changes as suggested.

2. NRCS commented that an example in the draft report where Arizona officials reported that activities on federal lands contribute to 50 percent of the water quality problems in the state provides no indication of the relative size of the federal contribution to these waters. This information was provided by state officials who are required by the Clean Water Act to routinely assess their waters for water quality problems and identify contributing sources. While they do not quantify the contribution of individual sources to impaired waters, Arizona officials did indicate that federal activities were the "primary" source of 50 percent of the water quality problems in the state. We have added this distinction to the report.

3. NRCS requested that we revise the language in the draft to clarify that water quality is not the sole purpose of funding for EQIP and the Conservation Reserve Program, noting that environmental benefits can include water quality, but may not have this benefit in some locations. We have clarified the report where appropriate. However, we asked agencies to report on programs that in their opinion helped address nonpoint source pollution. By including programs in this report, we are not suggesting that all the programs focused exclusively on nonpoint source pollution. We recognize that some programs simply help reduce nonpoint source pollution through the implementation of other program objectives.

4. NRCS suggested that we add an item to our graphic depicting possible sources of nonpoint source pollution in a watershed showing "all vehicle traffic" as an additional possible source. We agree that vehicle traffic is

another possible source of nonpoint pollution, however, our graphic was not intended to include every pollution source.

5. See comment 1.

6. NRCS commented that to say that all funds for the EQIP program went to nonpoint source may be "stretching it, since some areas do not have enough rainfall to have runoff or be a source." We reported that 100 percent of EQIP funding addressed nonpoint source pollution based on information from the agency. The rationale provided by the agency in response to our questionnaire noted that, "EQIP is intended to solely address nonpoint source pollution from farms and ranches." In addition, we discussed the issue of percent of program funds targeted to addressing nonpoint source pollution several times with agency officials to be sure that the 100-percent figure was appropriate. Moreover, one conservation official addressed the issue of lack of rainfall by pointing out that such areas will either (1) not be capable of producing crops and, therefore, not be eligible for funding or (2) be irrigated, making runoff a possibility.

7. NRCS commented that EQIP should not be characterized as a nonpoint source pollution-reduction program. As discussed in comment 6, we reported information on the program based on information the agency provided in response to our questionnaire. To avoid any confusion, we have revised the text in the report to reflect language in the final rule as suggested by the Service.

8. The draft did not include the two programs cited in this comment, the Wetlands Reserve Program and the Forestry Incentives Program, because agency officials initially indicated that neither program met our criteria for inclusion. We included information on the Wetlands Reserve Program provided later by USDA in appendix II; however, no program and funding data were provided for the other program.

9. NRCS commented that the section heading, "Federal Activities That Contribute Significantly to Nonpoint Source Pollution," leaves the impression that all activities cause nonpoint source pollution. NRCS suggested that the heading be reworded to reflect that activities contribute when not properly managed, and remove the word "significant." We agree that water quality impacts can be minimized by the use of appropriate management practices and discuss some of these practices in each of the activity sections. However, such practices may not always be in place. We have revised the heading to acknowledge that all the activities do not

necessarily contribute to nonpoint source pollution, but rather "have the most potential" to contribute. We have left the reference to "significant" contributions because this section discusses the activities that federal and state officials identified as those with the potential to be the most significant contributors.

10. NRCS questioned the example that "30 percent of all impaired waters in the state of Oregon are due to grazing." We reported that "federally authorized grazing contributes to the degradation of about 30 percent of all impaired waters in the state." This information was obtained from the state nonpoint source pollution program manager based on the state's list of impaired waters. As discussed in comment 2., states routinely assess their waters for water quality problems and identify the sources contributing to the problems, as required by the Clean Water Act, but do not quantify the contribution of individual sources.

11. NRCS commented that two of the programs included in the draft did not address nonpoint source pollution, nor was it a collateral benefit of the programs. As discussed in comment 8., we included information provided by the respective agency program officials. Regarding the National Resource Inventory, the agency said that the program addressed nonpoint source pollution because it collects data on agriculturally related natural resource elements that can be used to provide some measure of nonpoint source pollution rates. For the Watershed Protection and Flood Prevention Program, the agency said that, among other objectives, the program is intended to improve or enhance water quality and quantity and that "about 975 watershed projects have a significant impact on nonpoint source pollution."

12. The Agricultural Research Service (ARS) commented that we did not address the adequacy of scientific understanding of nonpoint source pollution. Such an analysis was outside the scope of this review.

13. ARS also commented that there was inconsistency in the type of programs addressing nonpoint source pollution identified in our report. See comments 8 and 11 for information regarding how we identified programs for inclusion in the report.

14. We have added information on ARS' Water Quality/Research, Development, Information Program, as requested.

15. The Forest Service suggested that the relationship between the magnitude of federal lands and the proportion of nonpoint source pollution should be conditioned in terms of potential rather than actual, noting that management practices intended to minimize nonpoint source pollution are prescribed for all Forest Service projects. As discussed in chapter 4, information obtained from the states we contacted does in fact show that a significant amount of water quality problems can be attributed, at least in part, to activities occurring on federal land. However, we acknowledge the variability in this relationship, noting that the degree of pollution in specific areas may depend on site-specific characteristics such as geographic and hydrologic conditions, the type of activities occurring and intensity of use, and management practices applied to minimize impacts. Accordingly, as suggested by the Forest Service, we modified language in this chapter where appropriate to characterize the association between a large portion of federally owned land to contributing a significant amount of nonpoint pollution as potential rather than actual.

16. As an additional point, the Forest Service provided data to show how silvicultural activity is occurring on just a small part of national forest lands. We did include information regarding the decline of silvicultural activities in the report; however, Forest Service research has shown that pollution from harvest sites may continue for decades after a harvest has been completed. In addition, silviculture is just one of the many activities occurring on Forest Service land that may lead to nonpoint source pollution. While federal agencies are implementing practices to minimize water quality impacts from current activities, agencies must also deal with impacts resulting from past activities and practices. In several sections of chapter 4, we acknowledge that past practices contribute to water quality impacts.

17. The Forest Service commented that it devotes more resources to addressing nonpoint source pollution than is reflected in the one program included in our report—the Watershed Research Program. The Service said that the control of nonpoint source pollution is the responsibility of each resource program manager. While the Service did not provide cost estimates for these activities, we have noted this comment in the report.

18. The Cooperative State Research, Education, and Extension Service commented that we did not discuss the research needs associated with nonpoint source pollution. Assessing the adequacy of funding for nonpoint source pollution research was outside the scope of this review.

19. The Extension Service encouraged coordination among EPA and other USDA agencies within the Department with regard to watershed-based modeling research, but noted that NRCS was the only agency we discussed in the report. We agree that all relevant agencies in USDA should coordinate research on nonpoint source pollution modeling to avoid duplication and help move scientific understanding of the problem forward as efficiently as possible. We included NRCS in our report because it was one of the few federal agencies that had developed a nationwide model relevant to our evaluation of EPA's nonpoint source control modeling approach.

20. The Extension Service suggests that we examine biases in the states' evaluation of surface water quality problems. Such an analysis was outside the scope of this review.

21. The Extension Service also makes some observations on, and criticisms of, the Clean Water Action Plan and how it can be used as a means to further address nonpoint source pollution issues. We provided factual information about the Clean Water Action Plan since several of its components address nonpoint source pollution, in particular funding increases for several of the programs included in our report. However, an analytical evaluation of the Action Plan (including the assumptions made regarding the current understanding of water quality problems and associated research and monitoring needs) was beyond the scope of this review.

Comments From the Federal Energy Regulatory Commission and Our Evaluation

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D. C. 20426

OFFICE OF HYDROPOWER LICENSING

JAN 20 1999

Mr. David G. Wood
Associate Director, Environmental Protection Issues
Resources, Community, and Economic Development Division
General Accounting Office
Washington, D.C. 20548

Dear Mr. Wood

Thank you for your January 4, 1999, letter (B-281614) providing a draft of your proposed report entitled Water quality: Federal Role in Addressing-and Contributing to-Nonpoint Source Pollution (GAO/RCED-99-45) for our review and comment.

See comment 1.

See comment 2.

We agree with the report's major conclusions and believe that the GAO staff has made an impressive effort in presenting this very complex topic. Attached are specific comments to clarify the relationship between hydromodification, hydropower, and nonpoint source pollution. For reasons cited in our comments, we request that you modify references to hydropower as a source of pollution before releasing the report.

See comment 3.

In addition, we explain why hydropower projects licensed by the Federal Energy Regulatory Commission (Commission) should be distinquished from those operated by federal agencies, and among water projects that may or may not include hydropower. Lastly, we include comments and analyses that we feel are needed to give a better understanding and perspective on the federal role in contributing to, and controlling, nonpoint source pollution. Recognizing the short time frames involved, we would like to see these topics introduced in this report, even if the more detailed analyses appear in the year 2000 report.

Should you have any questions about these comments, or any other issues involving the Commission, please contact me at(202) 219-2700.

Sincerely,

Carol Sampson

Carol Sampson
Director,
Office of Hydropower Licensing

Attachment

The following are GAO's comments on FERC's comments on our draft report. The Commission agreed with the report's major conclusions, but raised three concerns regarding how hydropower is characterized in the report. The Commission also made several clarifications and technical points that were incorporated into the report as appropriate. Our comments to the Commission's three major concerns follow.

1. FERC expressed concern that a lay reader would misconstrue the word "hydromodification" or think that the term is interchangeable with "hydropower." We believe we have properly defined hydromodification to make it clear that hydropower is just one example of hydromodification activities. In each instance where we introduce the term hydromodification, we refer to the major categories of hydromodification—channelization and dams and reservoirs. In addition, we provide explanations of the types of projects included in each of the categories. For example, in the Results in Brief, we provide the example for hydromodification, "such as building and operating dams, or modifying rivers for flood control and other purposes." Similarly, in the first paragraph of the hydromodification section, we describe hydromodification activities as "channelization and the construction and operation of dams." Later, in the subsection on dams and reservoirs, we describe such structures as being "multipurpose, such as providing municipal and industrial water supply, flood control, recreation, irrigation, and power generation."

2. FERC believes that we have misrepresented hydropower as a nonpoint source of pollution, stating that "hydropower is not a nonpoint source of pollutants, but rather an activity that can positively or negatively affect the impacts of pollutants introduced by nonpoint sources." However, as described in an EPA technical document regarding management measures for sources of nonpoint pollution, dams (which can be constructed for many purposes including flood control, power generation, irrigation, and municipal water supply) "can generate a variety of types of nonpoint source pollution in surface waters."[1] Examples of such pollution are discussed in our report such as increased downstream erosion and changes in water temperature and dissolved oxygen levels that may impact aquatic life. FERC acknowledges in its comments that hydropower projects do have these negative effects. Therefore, in these instances, we believe it is appropriate to portray hydropower as an original source of nonpoint pollution. However, we acknowledge that most of our examples regarding

[1]Guidance Specifying Management Measures For Sources Of Nonpoint Pollution in Coastal Waters, U.S. Environmental Protection Agency, (Jan. 1993).

the impacts of hydromodification are hydropower examples and may have overemphasized the negative impacts of hydropower in this section. We have revised the text to recognize that the impacts discussed may result from any of the types of hydromodification, not just hydropower projects.

3. The Commission commented that the draft does not distinguish between federally operated projects and Commission-licensed projects, which are generally smaller and, therefore, should not be represented as having the same environmental impacts. The draft did, in fact, distinguish between Commission-licensed projects and federally operated projects, noting the number of projects of each and, in particular, the environmental requirements to which the nonfederal projects are subject. Moreover, while we acknowledge FERC's point about the relatively smaller size of FERC-licensed projects (.09 billion kilowatt hours per year versus .9 billion kilowatt hours per year for federally operated projects), we would point out that there is a considerably greater number of these smaller projects nationwide—1,750 FERC-regulated projects versus 133 federally operated projects. Beyond this distinction, however, we would add that in many respects, the types of impacts described apply generically to dam and reservoir operations regardless of whether it is a FERC-licensed project, a federally operated project, or whether the project's primary purpose is for a use other than hydropower. In addition, as with the other sources of nonpoint pollution, the extent of the potential impact varies significantly with site-specific characteristics and management practices employed at the project.

Comments From the Department of the Interior and Our Evaluation

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

JAN 26 1999

Mr. David G. Wood
Associate Director,
Environmental Protection Issues
U.S. General Accounting Office
441 G. Street, NW
Washington, DC 20548

Dear Mr. Wood:

The Department of the Interior has reviewed the General Accounting Office's (GAO) draft report entitled, "WATER QUALITY: Federal Role in Addressing - And Contributing to - Nonpoint Source Pollution" (GAO/RCED-99-45). The Department is concerned with some of the findings in the draft report. Comments and technical corrections made by the individual bureaus are enclosed.

See comment 1.

See comment 2.

In some instances, the draft report appears to equate the magnitude of nonpoint source pollution to the amount of federally managed land involved. We do not believe this relationship is valid. In addition, federal land managers are working diligently to develop and implement new land-management practices which will conserve our natural resources and reduce the impacts of the activities they conduct or permit on vulnerable water resources. We believe that these new land-management practices will significantly reduce nonpoint source pollution from federally managed lands in the future. The Department is aware of the complex issues you have raised and will continue to refine its land-management practices to reduce the magnitude of nonpoint source pollution from its lands.

We appreciate the opportunity to review and comment on this draft GAO report.

Sincerely,

Sylvia V. Baca
Acting Assistant Secretary,
Land and Minerals Management

Enclosure

The following are GAO's comments on the Department of the Interior's letter dated January 26, 1999. Additional specific comments were provided by the individual services and bureaus within Interior and have been addressed as appropriate. Many of these specific issues are also discussed at the end of chapters 2, 3, and 4. Our comments on the Department's two major concerns follow.

1. Interior expressed concern that the draft report appeared to equate the magnitude of nonpoint source pollution to the amount of federally managed land involved. As discussed in chapter 4, information obtained from the states that we contacted does in fact show that a significant proportion of water quality problems can be attributed, at least in part, to activities occurring on federal land. However, we acknowledge the variability in this relationship, noting that the degree of pollution in specific areas may depend on site-specific characteristics such as geographic and hydrologic conditions, the type of activities occurring and intensity of use, and management practices applied to minimize impacts. Accordingly, where appropriate, we modified language in this chapter to characterize the contribution to nonpoint source pollution from federal lands as potential rather than actual.

2. Interior also points out that federal land managers are working diligently to develop and implement new land management practices which will conserve our natural resources and reduce the impacts of the activities they conduct or permit on water resources. We agree that water quality impacts can be minimized by the use of appropriate management practices and discuss some of these practices in each of the activity sections. However, such practices may not always be in place. Moreover, as pointed out by federal and state officials, as well as by Forest Service research, water quality impacts continue to result from past management practices, such as the type of heavy grazing that occurred in the late 1800s and past timber harvesting methods.

Comments From the Department of Commerce and Our Evaluation

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

FEB - 2 1999

Mr. David G. Wood
Associate Director
Environmental Protection Issues
General Accounting Office
Washington, D.C. 20548

Dear Mr. Wood:

Enclosed is a copy of the Department of Commerce's reply to the General Accounting Office draft report entitled "Water Quality: Federal Role in Addressing and Contributing to Nonpoint Source Pollution."

These comments are prepared in accordance with the Office of Management and Budget Circular A-50.

Sincerely,

William M. Daley

Enclosure

COMMENTS:

Now on p. 20.

- On page 18, the first full sentence should be revised to give a better understanding of what section 6217 is and NOAA's role in the effort. We suggest the sentence be revised as follows:

> Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990, administered jointly by EPA and NOAA, outlines a more rigorous program for states to deal with nonpoint sources impacting coastal waters. The section requires states to address significant sources of nonpoint pollution from agriculture, forestry, urban areas, marinas and hydromodification. This program differs markedly from section 319 in that states are required to include in their programs enforceable policies and mechanisms to ensure that management measures to address these sources are implemented.

See comment 1.

Now on p. 38.

- The purposes of the Coastal Zone Management Act described on page 39 give an impression that special area management plans are the second major purpose of the statute. We suggest that this could be revised as follows:

> Delete "(1)" on the fourth line, and put a period after "resources" in the next line. The next sentence would then read: The statute also encourages ... decision making.

Now on p. 86.
See comment 2.

- Regarding the funding table on page 92, we do not understand what GAO is trying to reflect in the second column for the Coastal Nonpoint Pollution Program. The column is titled "obligations". We were appropriated $1M in FY 1998. EPA matched those funds with another $1M, and the entire $2M was dispersed to the states.

The following are GAO's comments on the Department of Commerce's letter dated February 2, 1999. The Department provided a few technical clarifications which were incorporated into the report as appropriate. Our comments on the Department's two concerns follow.

1. Report modified as suggested.

2. The Department commented that in appendix II, we did not have complete data for the Coastal Nonpoint Pollution Control Program. Commerce clarified that additional program funding, $1 million, was provided by EPA for fiscal year 1998. We have added the additional funding data and its source.

Major Contributors to This Report

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