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ENVIRONMENTAL PROTECTION

EPA Faces Formidable Challenges Managing Water Quality Data

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Chairman Graham and Members of the Subcommittee:

I appreciate this opportunity to discuss work we conducted to assist the Subcommittee in its deliberations on the reauthorization of the Clean Water Act. As you know, we have conducted numerous reviews of EPA's water programs over the years to assist in Congressional oversight and to offer recommendations for improving program management. More recently, we have focused on the collection, management, and dissemination of water quality related data. As it has for several of its other environmental missions, EPA has been given leadership responsibility for ensuring the integrity of the nation's water resources. Deciding what scientific data and information to collect and how to best manage it is a central factor in water quality policies, influencing EPA's ability to perform specific statutory responsibilities.

In preparation for this hearing, you specifically asked us to identify (1) EPA's efforts to address water quality data shortcomings that are impeding performance-based assessments; (2) EPA's plans to improve water information systems; (3) factors affecting the use of remote sensing and satellite imagery for water quality-related purposes; and (4) progress made by the Intergovernmental Task Force on Monitoring Water Quality (ITFM) in addressing governmentwide data management issues. Over the last two months, we have discussed these matters with officials at EPA, the United States Geological Survey, the Office of Technology Assessment, and members of the ITFM.

Summary

Inconsistencies in how data are collected and managed by over 165 federal and numerous state water programs, along with problems involving incomplete or inadequate monitoring data, are recognized as key contributing factors that limit comprehensive assessments of water quality and safety. Initiatives are underway at EPA and on a governmentwide basis to address these data problems. First, EPA's Office of Water is reassessing strategic goals for its water programs and considering steps necessary to implement more comprehensive, performance-based measures of water quality improvements. Second, the Office of Water is proceeding with improvements to some of its important databases to facilitate access and use of data from several sources. Third, remote sensing and satellite imagery technologies could complement other analyses of physical environmental conditions, such as land use patterns, that impact water quality. Finally, EPA is chairing an intergovernmental task force that is preparing a governmentwide strategy to (1) coordinate water quality monitoring and assessment standards and procedures, and (2) improve data collection and dissemination. These efforts hold promise for improving decisions about the effectiveness of water quality programs. However, they are in early stages and face enormous challenges because of the resources and cooperation needed across federal and state governments.

Water Quality Data Are Abundant, but Difficult to Use and Narrowly Focused

To begin, I think it is useful to frame the challenges that confront the federal government as it seeks to improve its management of water quality data. Although EPA has prime responsibility for the bulk of federal laws that pertain to water quality, nine other federal departments or independent agencies collect or manage water data. In addition, over 165 different federal programs--supported by at least 75 different federal data holdings--and numerous state water programs exist for water quality matters. Despite this proliferation of data, opportunities for greater data exchange and aggregation are often lost because data are incomplete, incompatible, or of questionable quality. Our recently released report on the Geological Survey's National Water Quality Assessment Program illustrates the formidable barriers--the absence of common data standards and definitions, uncertainties about quality assurance controls, and differences in sampling and analysis techniques--that government agencies face as they strive for greater efficiencies in using and sharing data across organizational lines.[1]

Moreover, much of the data collected for water programs today are used to monitor facilities for point source pollution compliance and enforcement purposes under the Clean Water Act, such as specific chemical discharges from industrial and sewage treatment plants. However, according to EPA, many of the nation's water quality problems are attributable to pollution from millions of diffuse or nonpoint sources. For example, rainfall (or snowmelt) moving over or through the ground picks up natural and manmade pollutants, including fertilizers, toxic chemicals from urban runoff (oil, grease) and abandoned mines (acid), and sediment from poorly managed construction sites, crops, and forest lands. Vital monitoring data, nonetheless, are often missing on both the scope and the impact of nonpoint source pollution and on the effectiveness of potential solutions. As noted in our past work, without this data, public officials have had difficulty reallocating resources to deal with the most serious nonpoint source problems.[2]

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[1]National Water-Quality Assessment: Geological Survey Faces Formidable Data Management Challenges (GAO/IMTEC-93-30, June 30, 1993).

[2]Water Pollution: EPA Budget Needs to Place Greater Emphasis on Controlling Nonpoint Source Pollution (GAO/T-RCED-92-46, Apr. 7, 1992).

EPA and Congress, as evidenced by provisions in pending legislation amending the Clean Water Act, are outlining actions that would move the agency towards a watershed management and pollution prevention approach to improve water quality.[3] As you know, this proposed shift would focus resources on identifying the primary threats to human and ecosystem health within a watershed as a whole, in addition to pollution treatment and disposal through point source monitoring and discharge permitting controls. EPA believes that examining both the point and nonpoint sources within a watershed collectively will allow comprehensive assessments of a full range of water quality factors--chemical, physical, biological--needed to target risks and priorities more effectively. However, collecting, analyzing, and reporting on water quality problems in such a comprehensive, integrated fashion is a daunting task, given the many federal, state, and local agencies that share responsibility for amassing nonpoint pollution information.

Let me amplify on these issues by first turning to water quality data problems related to EPA's current responsibilities under the Clean Water Act, as well as the agency's plans for improvements that are applicable to the Subcommittee's interest in performance-based assessments of water quality improvements.

Potential Solutions for EPA's Water Data Problems Are Being Examined

Previously, we have reported on problems with EPA's discharge permit and nonpoint source pollution data and EPA has also acknowledged many problems with its 305(b) information--status reports submitted by the states on their water quality monitoring programs.[4] Besides the use of different monitoring approaches and assessment methodologies, longstanding data problems include inconsistent definitions, unknown or nonexistent quality assurance controls, and incomplete information about data collection procedures and sampling sites. As a result, it is difficult for EPA to

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[3]A watershed is a hydrologically defined drainage basin that includes not only the water resource--stream, river, lake, estuary, or aquifer--but also all the land from which water drains into that resource.

[4]Water Pollution: Greater EPA Leadership Needed to Reduce Nonpoint Source Pollution (GAO/RCED-91-10, Oct. 15, 1990); Water Pollution: EPA Budget Needs To Place Greater Emphasis on Controlling Nonpoint Source Pollution (GAO/T-RCED-92-46, Apr. 7, 1992); Water Pollution Monitoring: EPA's Permit Compliance System Could Be Used More Effectively (GAO/IMTEC-92-58BR, June 22, 1992); National Water Quality Inventory: 1990 Report to Congress, United States Environmental Protection Agency, Office of Water, Apr. 1992.

combine data to provide a consolidated picture of national water quality improvements, both spatially and temporally.

EPA has several activities underway to address these problems. The Office of Water's 305(b) Consistency Workgroup has constructed new guidelines to expand states' knowledge and use of data to make evaluations of biological conditions of waterbodies and to improve the consistency among state reported information. EPA expects these guidelines and clarifications to be incorporated into the 1994 state reporting cycle, with additional changes likely to follow in 1996. EPA program officials also indicated that they are making progress in developing guidance for criteria to be used in monitoring, evaluating, and reporting nonpoint source pollution for rivers.

Further changes in identifying and collecting data are being considered as part of a strategic planning exercise within the Office of Water to reexamine and redefine goals expected to be supported by performance-based assessments of water quality changes. Working with other EPA and federal offices and state water agencies, the Office is considering four broad goals covering all of EPA's major water quality responsibilities: (1) protect and enhance public health; (2) conserve and enhance ecosystems; (3) improve ambient water systems[5]; and (4) reduce pollutant loads (toxic and conventional). The Office of Water is working to establish measurable, performance-based subgoals based on quantifiable administrative and environmental indicators.

These efforts are constructive steps and complement congressional and executive branch interest in establishing performance goals, indicators, and measurements for federal programs. However, reaching consensus among EPA, other federal agencies, and the states on (1) targets for outcome performance that can be measured, and (2) performance indicators to measure progress is a formidable task that will require significant coordination and leadership from EPA. Office of Water officials have stated that severe limitations on staff and resources have restricted EPA's efforts to develop better techniques for monitoring nonpoint source pollution, help states develop water quality standards, and perform other critical functions identified as part of its Clean Water Act responsibilities. Still, EPA's water quality budget priorities have been consistently and heavily oriented towards point source problems and the Office of Water has not identified the program costs associated with its more comprehensive

[5]Ambient water quality refers to the general prevailing physical, chemical, and biological characteristics of water in a given waterbody. Ambient water quality conditions may or may not include effluents--treated or untreated waste material discharged into the environment from sources such as wastewater treatment plants, industrial complexes, or landfills.

water quality approach.

EPA Plans to Improve Information Systems

As you know, the Office of Water maintains some of the largest and most important national water-related databases, containing millions of monitoring and compliance observations used by EPA, other federal and state agencies, researchers, public interest groups, and private citizens. Improvements are being planned for four key databases: (1) Storage and Retrieval of U.S. Waterways Parametric Data (STORET)--EPA's largest single repository for water quality sampling and monitoring data; (2) Ocean Data Evaluation System (ODES)--a system containing monitoring data on facilities discharging into marine waters; (3) Biological Information System (BIOS)--a subsystem of STORET containing data on aquatic organisms; and (4) Permit Compliance System (PCS)--the primary system used to track discharge compliance of regulated facilities.

In an effort to improve users' access and data-sharing with other EPA systems, the Office of Water is redesigning the STORET, BIOS, and ODES databases. Enhancements are also planned for PCS on an annual basis to address users' concerns, such as improved database query capabilities. The approach for improving STORET, BIOS, and ODES is not targeted at meeting broader management goals being developed by the Office of Water; instead, heavy emphasis is being placed on better supporting users' existing practices. As a result, the Office of Water may have an improved method for storing data, better user access, and larger capacity for storing water quality data, but the systems will not necessarily respond to the broader management goals currently under development. At the conclusion of our work, EPA officials stated they would begin addressing the broader goals in their redesign efforts.

Resources Not Yet Estimated for Use of Remote Sensing Technologies

EPA's watershed and pollution prevention approach needs comprehensive data consolidated from many sources to pinpoint water quality changes and their probable causes. Accordingly, you asked us to determine how EPA was using remote sensing technologies for water quality purposes, particularly satellite imagery and aerial photography, and factors affecting their greater usage. In pursuing this matter, we held discussions with officials from the U.S. Geological Survey because of their responsibilities and established, well-recognized expertise in water quality assessments and land mapping. We also talked with an official from the Office of Technology Assessment who is leading a series of comprehensive assessments of the civilian use of satellites across the federal government.

According to EPA officials, the agency uses data from remote sensing technologies for several important applications related to its water quality mission. These include (1) mapping and analysis of land uses that impact water quality, such as agriculture, forestry, and mining; (2) assessments of the physical habitat of aquatic species; and (3) detection of pollutant and thermal releases to waterbodies to assist in water pollution enforcement activities. In addition, U.S. Geological Survey officials said they used remote sensing data for planning of water quality surveys. EPA officials noted that several important benefits accrue from the use of remote sensing technologies, including more complete and timely understanding of land-use changes and their impacts on watersheds, reduced litigation costs because of photographic evidence of noncompliance, and safer inspection of toxic accidents and spills. However, remote sensing cannot be used as a substitute for the direct, labor-intensive collection and analysis of water samples. For example, remote sensing technologies cannot measure the quantity or concentration of chemical pollutants in water bodies. Also, coverage provided by the principal U.S. land resource satellite with the best resolution capabilities (LANDSAT) is so infrequent--once every 16 days--that many short-lived pollution run-off events that follow rainstorms are missed.

Despite these drawbacks, aerial photography and satellite imagery could complement other data gathering techniques and provide important information on land use changes and landscape characteristics affecting watersheds. However, the Office of Water has not yet developed specific plans or estimated resources for using these technologies to support its watershed approach.

Interagency Task Force Is Examining Governmentwide Water Quality Data Improvements

Because water quality data problems transcend agency jurisdictions and responsibilities, the Intergovernmental Task Force on Monitoring Water Quality (ITFM) has been established to develop an integrated, voluntary, nationwide strategy for ambient water quality monitoring. This strategy is expected to provide an organized process for water-quality monitoring that can meet the objectives of various monitoring activities, better integrate existing monitoring efforts, make more efficient use of available resources, distribute information more effectively, and provide comparable data and consistent reporting of water quality status and trends. Membership includes more than 90 representatives from 10 federal agencies, 8 state agencies, one interstate organization, and one Indian nation, with a representative from EPA's Office of Water serving as the Chairperson. The ITFM expects to submit a final report to the Office of Management and Budget in December 1994 outlining recommendations for strengthening coordination of a wide range of water quality activities, including improvements in monitoring data used for decision-making and program evaluations.

Several working groups from the task force are focusing on data collection and management problems and expect to make recommendations on data standards, common definitions, and metadata requirements.[6] Decision papers on many of these topics are expected to be circulated for review by September 1993. These activities, while still in working stages, show promise for identifying and planning measures to address governmentwide improvements to water quality monitoring, data collection, and information sharing. However, the federal and state resources necessary to implement the suggested changes remain undefined, and developing and implementing a nationwide strategy is an enormous task and will require commitment and cooperation from all levels of government.

Concluding Remarks

In summary, EPA is confronted with formidable challenges in defining and achieving clean water goals that emphasize watershed management and pollution prevention approaches. Without adequate resources and funding, these approaches stand little chance of making progress in improving the nation's water quality. Successfully supporting these new approaches requires (1) strategically reexamining the capabilities needed from its information technology investments to support this new direction, (2) defining the requisite resources; and (3) securing interagency and intergovernmental cooperation.

That concludes my statement, Mr. Chairman. I would be happy to answer any questions that you or other members of the Subcommittee may have about our work.

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[6]Metadata describe such things as how the data were collected, what limitations exist, and how the data are stored and can be retrieved.

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