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January 2002

# WATER QUALITY

## Inconsistent State Approaches Complicate Nation's Efforts to Identify Its Most Polluted Waters



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**Abbreviations**

CALM	Consolidated Assessment and Listing Methodologies
EPA	Environmental Protection Agency
PCB	Polychlorinated biphenyl
TMDL	Total maximum daily load
USGS	United States Geological Survey
WATERS	Watershed Assessment, Tracking, and Environmental Results



G A O

Accountability \* Integrity \* Reliability

United States General Accounting Office  
Washington, DC 20548

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January 11, 2002

The Honorable Don Young  
Chairman, Committee on Transportation and Infrastructure  
House of Representatives

The Honorable John J. Duncan, Jr.  
Chairman, Subcommittee on Water Resources and Environment  
Committee on Transportation and Infrastructure  
House of Representatives

Although the precise number is not known, the Environmental Protection Agency (EPA) believes that over 20,000 bodies of water throughout the country are too polluted to meet water quality standards. Among the primary concerns associated with these waters are human health problems, caused either directly by coming into contact with contaminated waters or indirectly through consumption of contaminated fish. Under the Clean Water Act, states must identify bodies of water that are not meeting applicable state water quality standards and submit a list of those waters to the EPA, along with an explanation of the methodology used to identify them. To bring these waters into compliance with the standards, states are required to establish a pollutant “budget”—or a total maximum daily load (TMDL)—for each pollutant causing a body of water to be impaired. A TMDL is the maximum amount of a pollutant that can enter into a body of water without exceeding the water quality standard for a pollutant.

In March 2000, we reported that states have little of the information they need to assess the quality of their waters and, in particular, to identify those that are impaired—a particularly serious problem, given the resources needed to address such impairments.<sup>1</sup> Concerned about possible inconsistencies in the way that states identify impaired waters and EPA conveys information about such waters to the public, you asked us to (1) identify and assess the effects of any differences in states’ approaches to identifying impaired waters, (2) determine how states ensure the quality of data used to identify impaired waters, and (3) assess the reliability of the information in EPA’s database of impaired waters. To respond to your

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<sup>1</sup> *Water Quality: Key EPA and State Decisions Limited by Inconsistent and Incomplete Data* (GAO/RCED-00-54, Mar. 15, 2000).

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questions, we analyzed written methodologies that all 50 states and the District of Columbia submitted to EPA with their lists of impaired waters. We also completed a telephone survey of water quality officials from 15 randomly selected states to obtain more detailed information about states' processes for identifying impaired waters, identify the methods they use to ensure the quality of data collected, and determine how accurately they believe their state's water quality is reflected in information that EPA provides to the public on the Internet. We also analyzed the EPA database containing states' data on impaired waters and TMDLs.

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## Results in Brief

The approaches used to identify impaired waters vary considerably among states. Variation among the states stems from a combination of factors, including differences in the (1) water quality standards (including designated or beneficial uses and criteria) for determining which waters are impaired; (2) types of monitoring practices used to ascertain whether these standards are exceeded; (3) procedures used to assess water quality data to make listing decisions; and (4) guidance EPA regions give on grounds for removing waters from state lists of impaired waters. This variation leads not only to inconsistencies in the listing of impaired waters but also to difficulties in identifying the total number of impaired waters nationwide and the total number of TMDLs that states say will be needed to bring such waters up to standards. Of particular note, there have been numerous cases in which neighboring states share a common body of water that is listed as impaired by one state but not by the other. Under the Clean Water Act and its regulations, EPA has provided some flexibility to states to develop listing approaches that are appropriate to their ecological and other conditions. However, some of the variations in approaches have no appropriate scientific basis. EPA has published one set of guidance that it believes will address some of these inconsistencies. It is also planning to issue a second set of guidance to improve consistency among state approaches and in state methodologies.

States apply a range of quality assurance procedures to ensure that data used to make impairment decisions are of sufficient quality. In general, the procedures vary in their rigor. While states have long used quality assurance procedures for the data they collect directly, they have become increasingly vigilant about applying such procedures to the data they use from other sources. Because of the significant consequences of designating a body of water as impaired, officials from all 15 states that we contacted said that they examine data from other sources to determine quality—although the level of quality assurance that the states apply varies. For example, we identified seven states across the country that

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have passed data integrity laws prescribing minimum data requirements, such as the number of samples needed to make water quality determinations. EPA officials told us that, overall, these states' efforts are an attempt to increase the quality and credibility of their listing decisions. They cautioned, however, that states should balance the need for quality with EPA's requirement that they consider all readily available data to avoid rejecting data that indicate an impairment could exist.

Owing, in part, to the inconsistencies in states' approaches to identifying impaired waters, the information in EPA's database of impaired waters is of questionable reliability. EPA has undertaken significant efforts to integrate states' data and present it to the public over the Internet, but the information it presents can be only as good as the information the agency enters into the underlying database. Inconsistencies in the data that states submit are compounded by the different ways that they submit data to EPA for inclusion in the system. For example, some states submit lists that count several small segments of a river or stream as individually impaired waters, while other states submit lists that identify larger segments of a river or stream as impaired. As a result, the numbers of impaired waters cannot be compared from one state to the next and EPA cannot reliably tally the number of TMDLs that must be completed nationwide. In addition, EPA's database distorts the size of some of the states' impaired waters when they are mapped on EPA's Web site. Less than one-third of the state water quality officials that we interviewed told us that their state's water quality is reflected "very" or "somewhat" accurately on the EPA Web site.

We are making recommendations to EPA aimed at increasing consistency in the ways that states develop and make changes to their lists of impaired waters. We are also recommending that EPA improve the way it characterizes information on its Web site so that users more clearly understand the limitations of the data presented. In commenting on a draft of the report, EPA said that the recommendations were reasonable, and noted that the agency has several initiatives under way to address some of the issues raised in the report. We agree that EPA's initiatives will help to address some of our recommendations. One of the initiatives, however, a key guidance document called the Consolidated Assessment and Listing Methodologies guidance, has not yet been issued. In addition, the EPA initiatives do not fully address recommendations designed to promote greater consistency in how states remove waters from their impaired waters lists, and how they list interstate waters. Accordingly, we did not revise the recommendations contained in our draft report. We also provided the draft to the Department of the Interior for comment. The

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Department's December 13, 2001, letter said that the report covered a complicated and detailed topic well (see app. II).

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## Background

The primary objective of the Clean Water Act is to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” As authorized under the act, states have primary responsibility for implementing programs to manage water quality. As a first step, states set water quality standards to achieve designated (or beneficial) uses for waters, such as recreational, agricultural, industrial, or other uses. These standards are then used to determine whether the states’ waters are impaired, among other things.

In addition to establishing water quality standards, states are also responsible for monitoring the quality of their waters, assessing all readily available water quality data to determine whether the criteria for particular waters are being met, and reporting on the quality of their waters to EPA. Generally, to monitor water quality, states select the rivers, lakes, and other waters for which they plan to collect data during a specific period of time and collect water samples from them. After the data are collected, the states analyze the data and compare the results to their standards to assess whether the water bodies are meeting standards. In assessing their waters, state agencies responsible for water quality programs can also use data collected by other state agencies, federal agencies, volunteer or academic groups, and other entities. For example, one source used by many states is the U.S. Geological Survey (USGS) within the Department of the Interior, which has a large program for monitoring water quality. Under section 305(b) of the act, states are responsible for reporting biennially on the quality of their waters, and EPA is responsible for compiling these reports into the National Water Quality Inventory. As part of this effort, EPA provides guidance to states on monitoring and assessing their waters.

In addition to reporting on the overall quality of their waters, the Clean Water Act requires states to identify waters that do not meet applicable water quality standards. Specifically, section 303(d) of the act requires states to list the waters within their state boundaries for which certain technological controls required under the act are not stringent enough to implement applicable standards. Under the act, EPA must approve the states’ lists. The 303(d) lists identify waters in which pollutants need to be reduced. States are required to develop a TMDL for each of the pollutants affecting each impaired body of water. Under the act, if states do not establish TMDLs for impaired waters, EPA must do so.

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While the states are primarily responsible for managing water quality, EPA is responsible for developing regulations and guidance implementing the act. In 1985, EPA issued water quality regulations requiring states to provide a list of impaired waters.<sup>2</sup> In 2000, EPA finalized major revisions to these regulations that would have required the states to develop more comprehensive lists of impaired waters and would have clarified the required elements of a TMDL. However, Congress postponed implementation of these revisions, in part because of widespread concerns among a variety of groups. Because the regulations were in flux during 2000, EPA waived the requirement for states to submit their lists that year; instead, states are required to submit their next list by October 1, 2002. In October 2001, EPA further postponed the effective date of the revised regulations to April 30, 2003. Prior to that time, EPA plans to develop a second set of revised regulations.

Concern over the impaired waters program has led to years of litigation among states, EPA, and interest groups. Lawsuits in 38 states have resulted in almost two dozen consent decrees requiring states to develop TMDLs or requiring EPA to develop them if states fail to do so. At congressional hearings in 2000, we and other organizations raised concerns over the ability of states to gather the data needed to monitor their waters, and in particular to support the identification of impaired waters needing TMDLs. As a result of these concerns, Congress requested the National Academy of Sciences' National Research Council to study the scientific basis for the TMDL program. The council issued a report in June 2001 that expressed support for the TMDL program but called for improvements in how impaired waters are identified and how TMDLs are developed.<sup>3</sup>

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## States Use Varying Approaches to Identify Impaired Waters

While the general process that states follow to identify impaired waters is similar, the specific approaches they use vary considerably among states. Generally, the process involves establishing water quality standards, gathering data on water quality through monitoring, and assessing the data to determine whether the criteria and standards are being met or whether a body of water is impaired (see fig. 1). If a state determines that a previously listed body of water is no longer impaired, then it can seek

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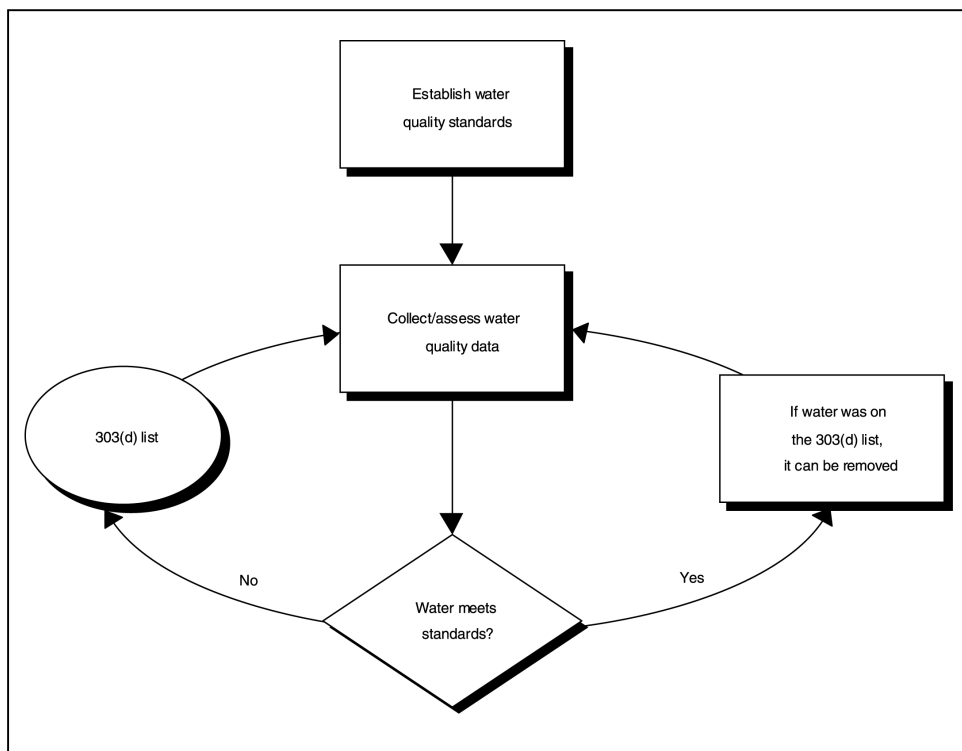
<sup>2</sup> EPA revised these regulations in 1992 to make the list a biennial requirement.

<sup>3</sup> National Research Council, *Assessing the TMDL Approach to Water Quality Management* (Washington, D.C.: National Academy Press, 2001).



EPA's approval to remove that body of water from its list. Variation in the approaches that states use occurs at each step in the process and causes inconsistencies in the listing of impaired waters. These inconsistencies are particularly apparent in cases of interstate waters. EPA published one set of guidance in November 2001 that it believes will address some of these inconsistencies. It plans to issue a second set in early 2002 to address other causes. However, EPA officials stated that the underlying causes of inconsistent listings require long-term action.

**Figure 1: Key Steps in Identifying Impaired Waters**



Note: Not all waters are monitored and assessed each cycle.

Source: GAO analysis of EPA documents.

## Water Quality Standards Are Often Inconsistent

Water quality standards can vary significantly among states. Variations in water quality standards arise from differences among states in two components of the standard-setting process: (1) the identification of designated (or beneficial) uses for a particular body of water and (2) the development of water quality criteria to protect each use. According to EPA, some of these variations are appropriately based on different ecological conditions but others are not. For example, states with coastal

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plains could appropriately have lower standards for dissolved oxygen than states with high mountain streams. The agency also notes that other variations are often not appropriate. Inappropriate variations may arise if states with shared or immediately adjacent water bodies designate them for different uses. For example, one may consider the water suitable for swimming and therefore have more stringent water quality criteria, while a neighboring state may consider the same water to be used for wading, which requires less stringent criteria.

## Designated Uses

Designated uses are the beneficial uses established by states, based on social and environmental factors that waters are intended to support. For example, a water may be designated for use as a public water supply or to support aquatic life, irrigation, or contact recreation. Officials in some states said that the designated uses in their states are appropriate while others did not. Of the 15 state officials that we interviewed, 8 acknowledged that designated uses in their states need to be revised. For example, all waters in Virginia are designated for swimming even though some of the waters are inaccessible and too shallow for swimming purposes. Other waters in Virginia are impaired by bacteria from wildlife sources and cannot achieve the primary contact use. As a result, these waters do not meet the water quality standard set for them. In other states, in some cases where designated uses are inappropriate and need revision, waters may be considered impaired by natural water quality conditions. Yet, one state may list such waters as impaired, while another might not. For example, according to their 1998 303(d) listing methodologies, Arizona precludes the listing of waters impaired by naturally-occurring conditions while California includes such waters on its list.

One explanation for the problems with many designated uses is that states established many of them en masse in the early 1970s in order to meet the requirements of the Clean Water Act. States had 180 days to put designated uses in place, and many used the highly general goals of the Clean Water Act—fishable-swimmable waters—as their designated uses. In addition, implementation of the act initially focused on installing controls on individual point sources of pollution and little attention was paid to whether overall water quality met specific standards.

Reflecting these concerns, the National Research Council's recent report states that many designated uses are too broad and need to be refined in order to incorporate the range of scientific data and social needs for water quality. The Council's report recommended that states' designated uses should be divided into several tiers to more adequately represent water quality conditions and that water quality criteria should have a more

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logical link to the designated use to sufficiently measure attainment. According to responses from our 15-state survey, such a refinement in states' designated uses and water quality criteria would most likely result in different waters being listed.

## Water Quality Criteria

Water quality criteria provide thresholds for determining whether bodies of water can support their designated uses. As with designated uses, criteria used by states vary and in many states need updating. Variation among states is primarily caused by different states focusing on different pollutants, mainly because of differences in water quality criteria. Illinois, for example, has numeric water quality criteria for two pollutants—sediment and nutrients—for which neighboring Indiana does not have numeric criteria. As a result, Illinois listed 32 percent of its waters as impaired by sediment, while Indiana listed none. Similarly, Illinois listed 22 percent of its waters as impaired by nutrients, but Indiana listed less than 1 percent as so impaired. In some instances, neighboring states may both have numeric criteria for a given pollutant, but the criteria may differ significantly. Connecticut and New York on the Long Island Sound have different criteria for dissolved oxygen and, therefore, list the Sound differently.

States also vary in the extent to which they use narrative criteria versus numeric criteria to make a listing determination. For example, Nevada focuses its listing determinations on violations of numeric water quality criteria. On the other hand, Massachusetts used narrative criteria to list approximately one-third of its reported impairments because it felt that the designated use was impaired. With the criteria, Massachusetts considered a lake to be impaired (for swimming) if noxious aquatic plants covered over 50 percent of its area. Massachusetts' officials conceded that their narrative criteria may not correctly identify when a lake is impaired for various uses, and they are currently working on revising the water quality standards.

Other states also discussed the need to revise criteria that are difficult to use in identifying impairments. Officials in 14 of the 15 states represented in our interviews believe that water quality criteria in their states need to be revised. Their views are consistent with the National Research Council, which noted in its report that criteria should be measured by reasonably obtainable monitoring data and should be defined in terms of magnitude, frequency, and duration. Some state officials mentioned that they would like to switch their narrative criteria to numeric criteria to provide a clearer threshold for demonstrating whether an impairment exists. Officials indicating their water quality criteria need to be revised told us

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that such revisions could change the waters states have listed and the number of waters listed. The most common pollutants for which the state officials we interviewed believe water quality criteria need to be revised are nutrients,<sup>4</sup> bacteria, sediment, dissolved oxygen, and metals. These five pollutants have been found to be among the leading causes of impairment nationwide.

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## Monitoring Practices Differ Significantly

States use a variety of monitoring practices. In order to determine whether water quality standards are being met, states monitor their waters by collecting samples of water or other indicators such as sediment, fish, or macroinvertebrates. To establish a monitoring system, states select which water bodies to monitor and determine, based on their water quality standards, the conditions for which they will sample and test. They also determine how often to take samples. In addition to their own data, states can use data from other sources such as universities, other federal and state agencies, and volunteer groups. Variation in states' practices can be seen in the types and comprehensiveness of each state's monitoring.

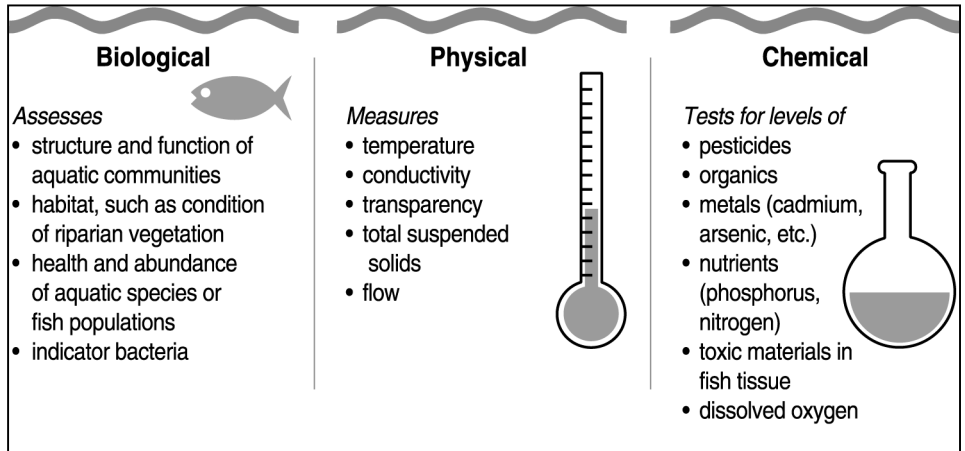
## Types of Monitoring

States monitor water quality conditions in three ways: chemical monitoring is used to assess levels of dissolved oxygen, suspended sediments, nutrients, metals, oils, and pesticides; physical monitoring is used to assess general conditions such as temperature, flow, water color, and the condition of stream banks and lake shores; and biological monitoring is used to assess the abundance and variety of aquatic plant and animal life and the ability of test organisms to survive in sample water (see fig. 2). USGS officials recommend that states utilize all three types of monitoring to help ensure that water quality conditions are adequately characterized. The officials suggested that although biological indicators may be used to identify the condition of the waters, physical and chemical factors such as improving habitat or reducing discharges will be adjusted to achieve biological goals. Similarly, the National Research Council reported that biological indicators integrate the effects of multiple stressors over time and space and recommended that they be used in conjunction with physical and chemical criteria.

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<sup>4</sup> EPA issued guidance for numeric nutrient criteria in October 2001. Wisconsin officials told us that the number of waters on their 303(d) list would increase by approximately 10 percent if they switched to this guidance from the narrative criteria they currently use.

**Figure 2: Types of Monitoring and the Pollutants or Conditions That They Measure**



Source: GAO analysis and interpretation of EPA data.

States vary in their emphasis on these different types of monitoring. For example, Illinois, Maine, and Ohio rely primarily on biological monitoring while Texas and Utah rely on chemical and physical monitoring. A 1998 Ohio study suggests how these divergent monitoring approaches may yield different impairment determinations for waters.<sup>5</sup> This study found that of 645 waters monitored, 50 percent met chemical but not biological criteria. It also showed that the number of impaired waters in the state increased from 9 percent of assessed waters in 1986 to 44 percent in 1988, and that the increase was due primarily to the increased use of biological monitoring to support numeric biologic criteria. Water quality managers in Utah stated that they hope to increase biological and habitat monitoring depending on available funding and it is probable that more impaired waters would be identified and listed as a result.

In addition to differences in the types of monitoring that states perform, states also differ in the emphasis that they place on various pollutants in their monitoring programs. For example, according to Indiana officials, Indiana conducts more bacteriological monitoring than bordering states, and has consequently identified 13 percent of its impaired waters as impaired by bacteriological pathogens. In comparison, neighboring Illinois and Ohio, which conduct less bacteriological monitoring, have identified

<sup>5</sup> Chris Yoder and Edward T. Rankin, "The Role of Biological Indicators in a State Water Quality Management Process," *Environmental Monitoring and Assessment*, vol. 51 (1998), pp. 61-88.

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Comprehensiveness of  
Monitoring Programs

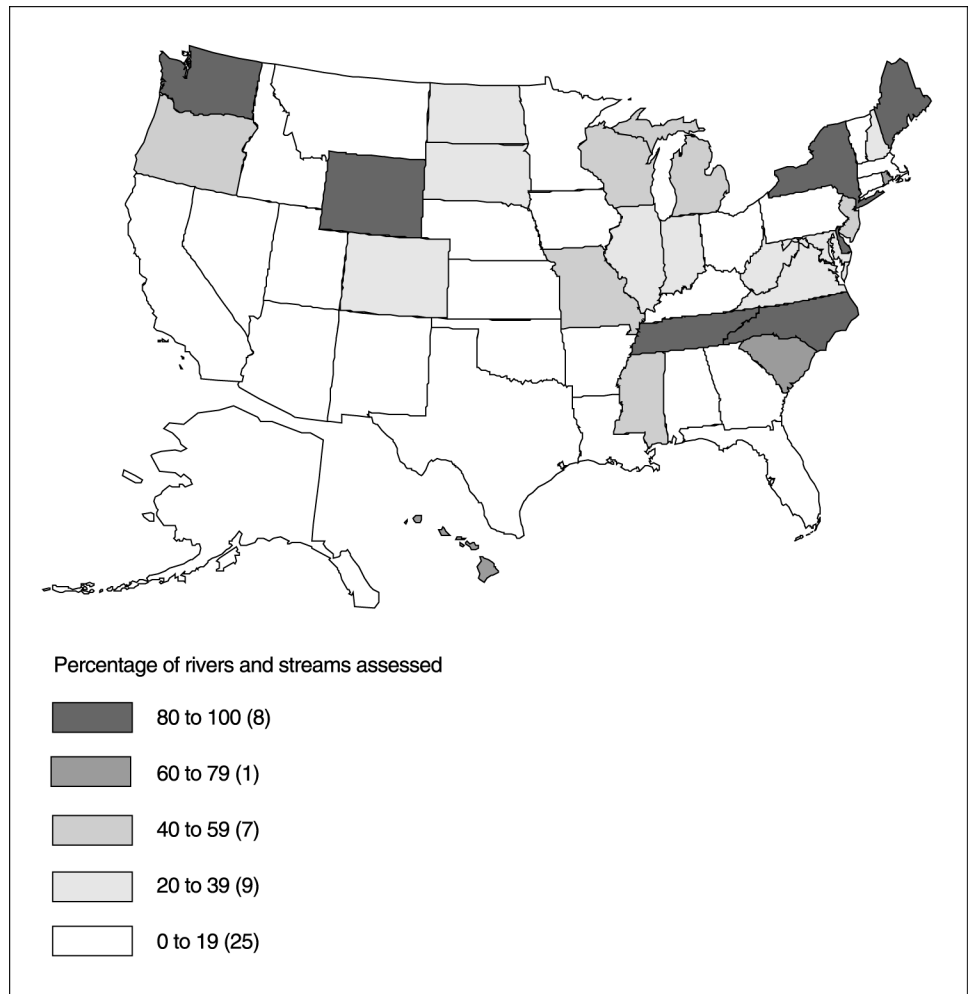
only 1 and 2 percent, respectively, of their impaired waters as impaired by such pathogens.

States also vary in the comprehensiveness of their monitoring programs. In 1998, the percentage of rivers and streams monitored and assessed by states ranged from 0 to 100 percent; 39 states had monitored and assessed under 50 percent of their rivers and streams. Similarly, the percentage of lakes, reservoirs, and ponds monitored and assessed by states ranged from 0 to 100 percent; 18 states monitored and assessed less than 50 percent of these waters (see figs. 3 and 4). Finally, several states that have estuaries and ocean shorelines monitored and assessed 100 percent of these waters; however, other states have not monitored and assessed these waters (see app. I for a detailed list of the percentages by state). As we noted in our March 2000 report, state officials told us that more comprehensive monitoring would have identified more impaired waters. In the 50-state survey conducted for that report, just 18 states reported that they had a majority of the data they needed to place assessed waters on their 303(d) list. Most respondents said that increased monitoring of their state's waters would be most helpful in improving their 303(d) lists.<sup>6</sup>

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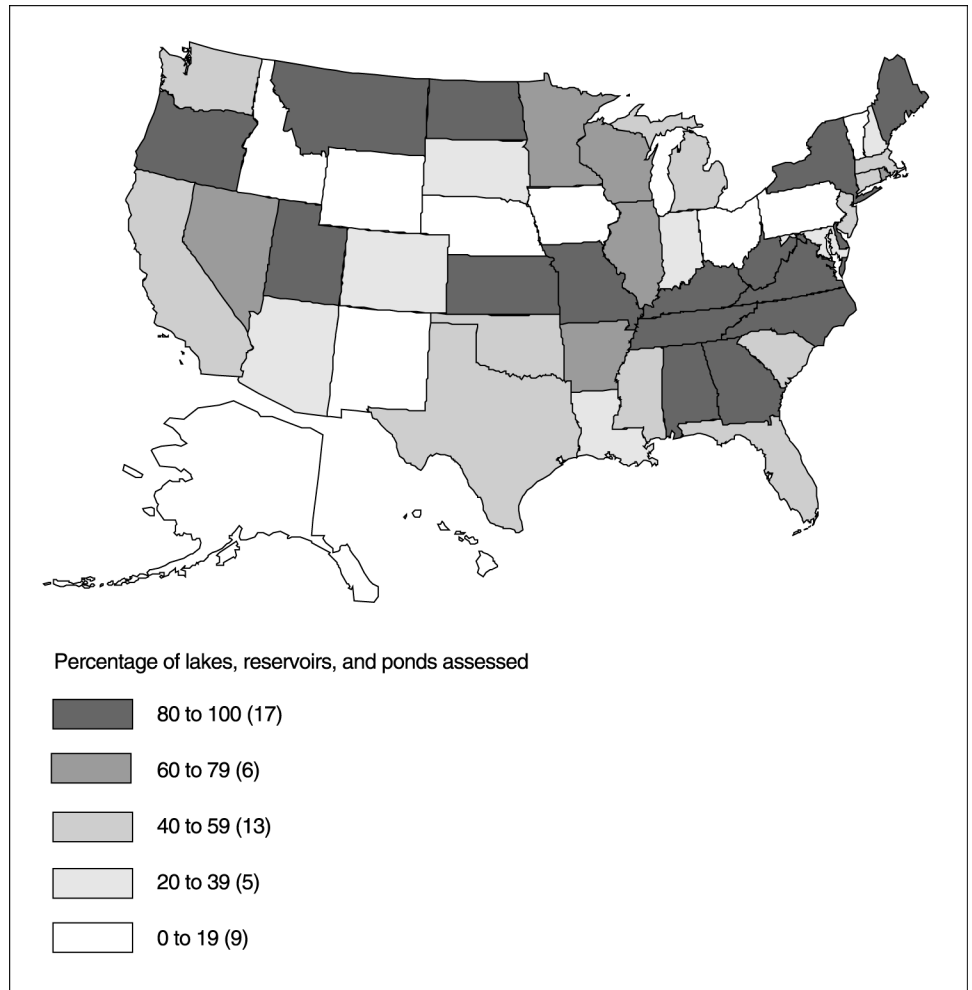
<sup>6</sup>Because monitoring all waters in a state is prohibitively expensive, states generally choose sites to monitor either on a targeted basis or on a random basis—called probability-based monitoring. Currently, many states use a targeted approach to monitor their waters, which means that monitoring points are selected judgmentally or for a purpose. The points can be placed either in a fixed fashion or can be done by rotating basin, which involves the state monitoring and assessing a portion of its watersheds each year in a rotating fashion. With targeted sampling, unless complete coverage can be achieved, the data cannot be used to draw conclusions about the extent to which the state's entire inventory of waters is attaining water quality standards. Probability-based monitoring involves placing monitoring points in a statistically random pattern, which allows the state to reach conclusions about the status of all its waters. EPA guidance encourages states to incorporate probability-based monitoring into their monitoring practices. Thirty states are experimenting with probability-based assessments, with six states already using them. However, while the results will provide a percentage of all waters in the state that exceed criteria, probability monitoring does not identify the location of specific segments of water that exceed criteria. Thus, both probability and targeted monitoring are needed for 305(b) and 303(d) reporting.

**Figure 3: Percentage of States' Rivers and Streams Monitored and Assessed**



Source: EPA's 305(b) report for 1998.

**Figure 4: Percentage of States' Lakes, Reservoirs, and Ponds Monitored and Assessed**



Source: EPA's 305(b) report for 1998.

States are required by regulation to assemble and evaluate “all existing and readily available water quality-related data and information,” including data from external sources such as federal agencies, volunteer or academic groups, and other entities. However, states vary in their use of these sources of data. Officials we interviewed from 7 of the 15 states said that they used external sources of data to a “moderate” extent and officials from 5 states said they use the sources to a “minor” or “very minor” extent. Most state officials commented that external data and information



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received, although not used to make listing determinations, triggered follow-up monitoring by the state.

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## States Use Different Data Assessment Methods

After states collect data, they must have methods in place to assess the data to determine whether waters are impaired. States vary widely in their use of such assessment methods. The key differences that we found in states' assessment methods were (1) the extent to which states make listing determinations based on "monitored" versus "evaluated" data, (2) how states use fish consumption advisories in making impairment decisions, and (3) how states compare water quality data with water quality criteria in determining whether waters meet standards.

## Use of Monitored Versus Evaluated Data

According to EPA, monitored data are those that have been collected within the past 5 years and are believed to accurately portray water quality conditions. In contrast, evaluated data include monitored data that are more than 5 years old, as well as other types of information such as land-use data, predictive models, and other less precise indicators of water quality. The extent to which states use evaluated versus monitored data varies. For example, officials from 4 of the 15 states we contacted told us that at least 20 percent of the waters they listed as impaired were based solely on evaluative data, while officials in another 4 states explained that none of their impairment listings were based solely on such data. States also vary in how they define monitored data. According to our analysis of the 50 states' methodologies, some states considered data as "monitored data" only if the data were collected within the past 5 years (as recommended by EPA), while other states used a 7- to 10-year threshold.

## Use of Fish Advisories to Make Impairment Decisions

States varied considerably in their reliance on fish consumption advisories as a basis for listing impaired waters. In 1998, 47 states issued a fish consumption advisory of some kind, according to EPA's National Listing of Fish and Wildlife Consumption Advisories database. However, only 15 states had waters that were listed as impaired because of a fish consumption advisory, based on their 1998 303(d) list. Most of the other states either chose not to list their waters as impaired or counted a fish advisory as a single impairment for the entire state rather than counting each of the state's affected waters. For example, Wisconsin issued 447 fish consumption advisories for individual waters in 1998 and listed 307 waters as impaired for a fish consumption advisory in their 1998 303(d) list. On the other hand, Minnesota issued 825 fish consumption advisories for individual waters in 1998 but listed no waters as impaired for a fish consumption advisory in their 1998 303(d) list. EPA issued guidance on October 24, 2000, to help remedy this inconsistency between states by

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recommending that a state list a body of water as impaired if a fish consumption advisory shows that water quality standards are not being met.

### Methods to Determine Compliance With Water Quality Standards

States also vary widely in the methods they use to compare water quality data with water quality standards to determine whether waters are impaired. To determine whether water quality data demonstrate an impairment, states need to compare the data to the appropriate criteria. For monitored data, which may include multiple samples from one body of water, states decide how many samples need to exceed the criterion for a particular pollutant before that water is considered impaired. States vary both in the percentage of samples exceeding water quality standards that are needed to consider a body of water as impaired, and in the number of samples that need to be taken to consider the sampling data as representative of actual conditions. For example, as recommended by EPA, most states list waters as impaired by conventional pollutants if 10 percent of the samples taken exceed water quality standards. However, some states, such as Kansas and Nevada, list waters as impaired only if the water quality standard is exceeded in more than 25 percent of collected samples. In addition, some states require a minimum data set of 10 samples, while other states, such as Nevada and Arizona, require only 4 samples. Time frames within which the minimum number of samples must be collected also vary. Wyoming requires 10 samples to be collected over a 3-year period, while Nebraska requires 10 samples to be collected over a 5-year period.

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### States Remove Waters From Their Lists for Various Reasons

The option for states to remove listed waters is important because, as EPA and states acknowledge, in the past many waters were listed inappropriately. The reasons vary. For example, officials in one state said that they mistakenly assessed some waters against higher standards than necessary, which resulted in a number of waters being placed inappropriately on their 303(d) list. In some cases, waters were listed initially on the basis of little or no data. For example, officials from one state told us that about half the waters on its 303(d) list were listed on the basis of evaluated data. Upon additional monitoring of these waters, the state found that many meet standards and should therefore be removed from the 303(d) list.

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EPA regulations require states to demonstrate “good cause” before an impaired water can be removed from a 303(d) list.<sup>7</sup> Specifically, once a water body is listed as impaired, it must remain on the list until a TMDL is developed unless good cause is shown to remove it. According to the regulations, good cause includes (1) new data showing improvement in the water; (2) new information showing a flaw in the original impairment decision; or (3) changes in technological conditions, such as the use of new control equipment. Nonetheless, based on our analysis of the 50 states’ methodologies, states vary in their methods and justifications for delisting waters. These findings were corroborated by our interviews with officials in the 15 states we contacted, which demonstrated a widely diverse experience in the delisting process. For example, officials in 11 of the 15 states represented in our interviews cited a variety of reasons for delisting waters, including their belief that some waters were incorrectly listed in the first place; that the quality of some waters had improved; or that a TMDL was established for the water, eliminating the need to keep it on the 303(d) list.

We found that EPA regions play a key role in advising states on delisting matters. Some state officials told us that they had received guidance from their EPA regional counterparts on how to remove waters from their lists, while others reported receiving no such guidance. Moreover, the states that did receive guidance from their regional EPA office were provided with different “burdens of proof” before a body of water could be delisted. For example, state officials in one region said that their region’s policy allowed them the flexibility to delist a water using the same method that was used to list the water in the first place without new data. State officials in another region, however, said that regardless of how a body of water was originally listed, they could remove it only if they had new data showing that the body of water was now meeting water quality standards. Similarly, one region will allow states to remove waters that are not meeting water quality standards but that have an EPA-approved TMDL in place. Another region, however, will not support a delisting based only on an approved TMDL.

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## States List Interstate Waters Inconsistently

Evidence of variability in water quality standards, monitoring practices, assessment methods, and delisting methods is perhaps most clearly illustrated when examining waters that cross state boundaries or serve as

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<sup>7</sup> 40 CFR 130.7 (b)(6)(iv).

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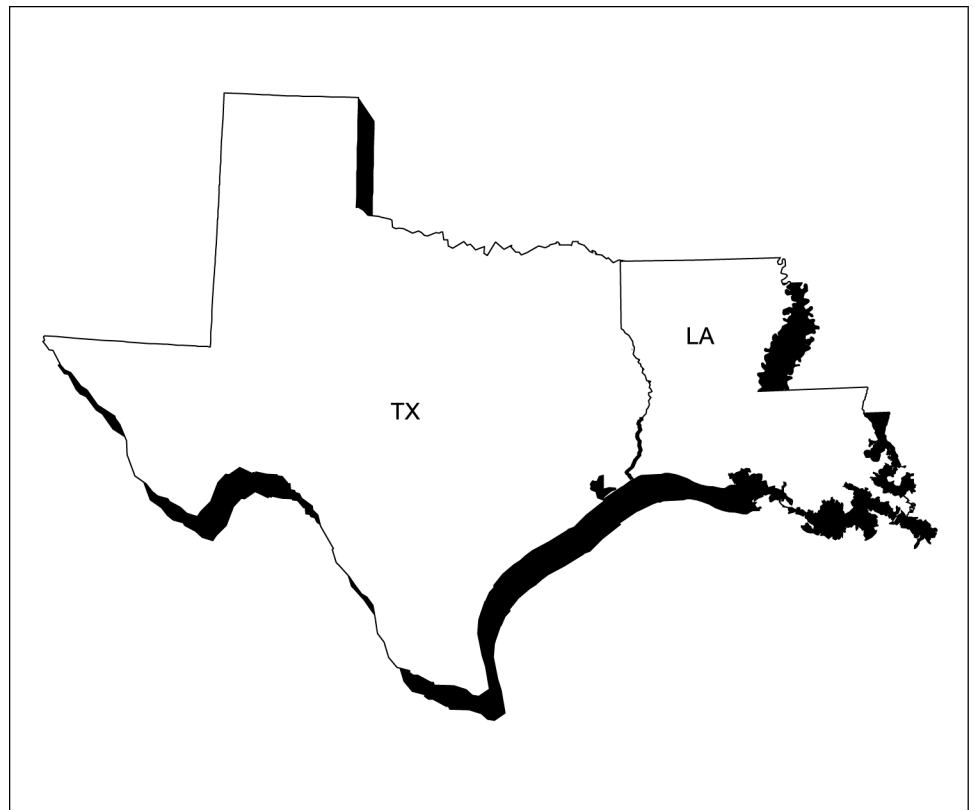
a boundary between states. Interstate waters often lie in areas with similar ecological conditions. Yet because of varying approaches by states in identifying impairments, situations have arisen frequently in which one state designates a body of water as impaired while another state does not, or in which one state designates a body of water as impaired for a certain pollutant while another state finds it impaired for a different pollutant.

EPA and the states have identified numerous inconsistencies of this kind. Examples include the following:

- According to the 1998 303(d) list, Rhode Island lists the Abbot Run Brook, which flows from Massachusetts into Rhode Island, as impaired to protect the brook's designated use as a drinking water source. Massachusetts does not list the brook because the state has not designated it for use as drinking water—a more stringent designated use.
- The Rio Grande, which flows from New Mexico and then forms the border between Mexico and Texas, is considered by Texas to be used for swimming—a “primary” human contact—and, therefore, Texas has a stringent standard for fecal coliform bacteria in the river. Texas currently lists the river as impaired for this pollutant according to its 1998 303(d) list. New Mexico, however, designates the river for wading—a “secondary” human contact. It therefore uses a less stringent standard for fecal coliform bacteria, and therefore does not list the river.
- The Sabine River along the border between Texas and Louisiana, south of the Toledo Bend Reservoir, is listed by Texas as impaired for pathogens on its 1998 303(d) list but not by Louisiana. The discrepancy is attributed to a difference in water quality criteria for fecal coliform bacteria to meet the contact recreation designated use as set in both states (see fig. 5).

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**Figure 5: The Sabine River Between Texas and Louisiana**

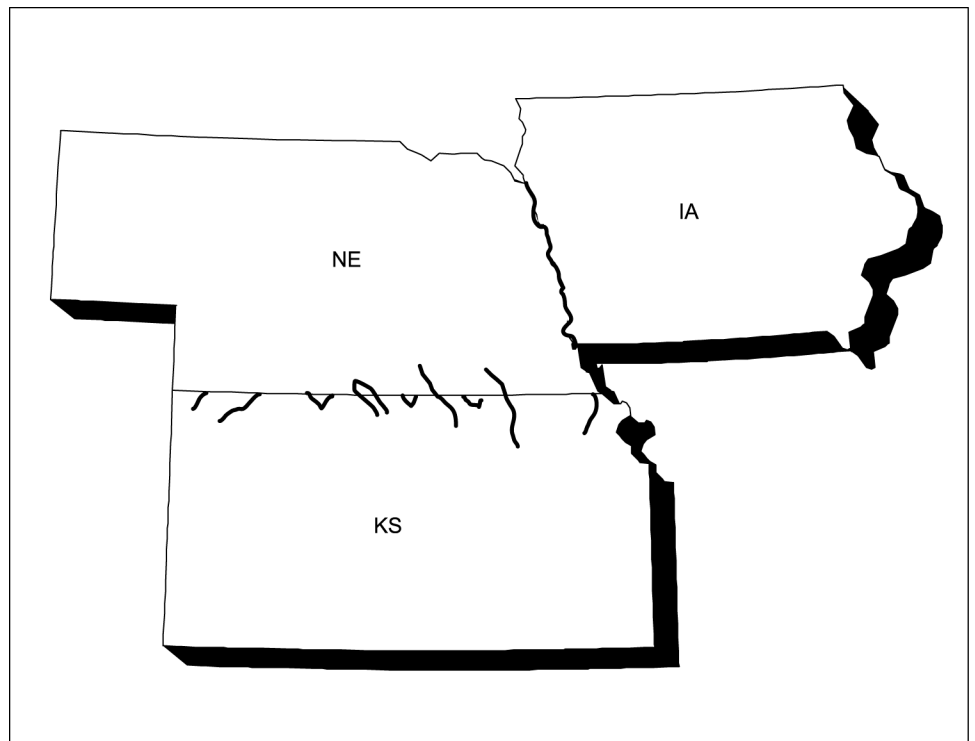


Source: EPA.

- The Menominee River, which forms the boundary between the northeast corner of Wisconsin and the southern tip of the Upper Peninsula of Michigan, is included in Michigan's 1998 303(d) list as impaired because of dioxin, pathogens, mercury, and a fish consumption advisory for polychlorinated biphenyls (PCB). The river is listed for a fish consumption advisory for mercury and PCBs in Wisconsin but it is not listed for dioxin or pathogens because of differences in the timing of monitoring and the type of monitoring conducted by the two states.
- Sugar Creek, flowing from North Carolina into South Carolina, is listed as impaired for zinc in South Carolina but is not listed for zinc in North Carolina according to the 1998 303(d) list. Both states have the same water quality standard for zinc, but the pollutant was not identified in North Carolina because it uses different monitoring practices than South Carolina.

- The Missouri River, along the border between Nebraska and Iowa, is listed in the 1998 303(d) list as impaired for pathogens in Nebraska but not in Iowa. Both states have the same primary contact recreation standard, but Iowa made its determination based on data from one monitoring station while Nebraska used data from multiple monitoring stations. On the other hand, the river is listed as impaired for sediment in Iowa but not in Nebraska. Neither state has a numeric criterion for sediment; hence, the difference in interpretations has led to a difference between the two states (see fig. 6).

**Figure 6: The Missouri River Between Nebraska and Iowa and Several Small Streams on the Border of Nebraska and Kansas**



Source: EPA.

- For several small streams on the border of Kansas and Nebraska, Kansas has done more monitoring than Nebraska, which is in the process of developing its monitoring network. As a result, Kansas has identified waters with impairments, while Nebraska has not (see fig. 6).

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Officials in 12 of the 15 states that we contacted told us they believe it is “somewhat” or “very” important that states collaborate when making listing decisions regarding cross-jurisdictional waters. At the same time, officials from 10 of the states also told us that they have not collaborated with neighboring states to make listing decisions, and officials from 5 of the states reported that they do not plan to collaborate with neighboring states in the future. According to a recent report by EPA’s Office of Inspector General, lack of collaboration between neighboring states was a primary contributor to inconsistent interstate listings.

Importantly, officials in 13 of the 15 states that we contacted reported that they have not received any guidance or assistance from EPA aimed at increasing consistency in the way states list interstate waters. Most of the states told us that they believe EPA should play a facilitator/mediator role and help states work together to make listing decisions on interstate waters. In connection with this, EPA officials noted that river basin commissions may serve as a forum for resolving inconsistent interstate listings. For example, the Delaware River Basin Commission, the Ohio River Valley Water Sanitation Commission, and the Susquehanna River Basin Commission have brought states together to discuss different approaches and data.

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### EPA Has Recently Begun Efforts to Improve Consistency Among States

EPA and many states have acknowledged variations in states’ listing approaches and the consequent inconsistencies, while at the same time recognizing that some level of state flexibility is appropriate in developing standards, monitoring water quality, and performing assessments. To improve consistency, EPA published one set of guidance in November 2001 and plans to issue a second set in early 2002. The first set is the 2002 Integrated Water Quality Monitoring and Assessment Report (Integrated Listing) guidance and the second set is the Consolidated Assessment and Listing Methodologies (CALM) guidance.

### Integrated Water Quality Monitoring and Assessment Report Guidance

EPA’s Integrated Listing guidance will merge existing guidance for monitoring and assessing waters under section 305(b) of the Clean Water Act and identifying impaired waters under section 303(d) and, according to EPA, will result in a more comprehensive and consistent description of states’ waters, including impaired waters. States are currently required to provide two separate lists of their impaired waters—one for EPA’s National Water Quality Inventory under section 305(b) and the other under section 303(d). The lists in each case have been created for different purposes. In the case of the inventory, the impaired waters are listed as part of a general effort to characterize the condition of each state’s and the

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nation's waters. The impaired water lists required under section 303(d) are prepared for the more significant purpose of determining which waters need TMDLs and potential remediation. In addition to the administrative burden of submitting two separate lists, the divergent purposes of these lists have led to inconsistencies between the two.

To address these inconsistencies, the Integrated Listing guidance will create five categories in which states will rank their waters: (1) waters that are attaining standards, (2) waters that are either meeting some standards and are not threatened in other standards, or that do not have enough information to list; (3) waters with insufficient data to make a listing decision; (4) waters that are impaired or threatened for one or more standards but for which a TMDL does not need to be developed;<sup>8</sup> and (5) waters that are impaired and need a TMDL. The guidance also recommends that the states use the National Hydrography Dataset to geographically define and reference their waters. The dataset provides comprehensive coverage of all waters and allows for a common framework for all states to use in addressing individual segments of waters across the United States.

## Consolidated Assessment and Listing Methodologies Guidance

EPA's proposed CALM guidance relies on state methodologies as a vehicle to increase the consistency among state approaches in developing their lists. The guidance contains "best practices" from state methodologies, such as appropriate ways to document statistical approaches used to assess monitored data or to document data quality considerations. In the short run, the CALM guidance is intended to improve states' listing approaches by improving the documentation of their water quality assessments and by making their listing decisions more transparent. In the long run, the guidance is also expected to result in more comprehensive and effective state water quality monitoring programs. According to EPA officials, sharing best practices among states increases the likelihood of states adopting similar approaches.

Our findings support EPA's assessment that state methodologies need to be more thorough and that the states' decision-making processes should be more transparent. States are required to include their methodologies for listing, including a reason for any decision not to use existing and

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<sup>8</sup> Waters that are impaired but do not need a TMDL may include those for which TMDLs have been completed and those for which the states plan additional actions that will improve the waters.



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readily available data and a description of the methodology used to develop the list, with their lists. However, we found that the 1998 methodologies that the states submitted were inconsistent in the amount and type of information provided. The methodologies ranged from a few pages that generally explained state decision-making processes to much more comprehensive documents detailing state monitoring practices and assessment methods. According to EPA, encouraging states to disclose more about their methods could help to alleviate inconsistencies in state listings by more fully explaining sources of inconsistency.

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## States Use a Range of Quality Assurance Procedures

States use a range of quality assurance procedures to ensure that the data they use to assess their waters are valid. Most states have quality assurance programs for their own monitoring efforts, which are generally based on EPA guidance. In addition to the data that they generate themselves to make listing decisions, states are required by regulation to consider existing and readily available data from other sources, such as universities, volunteer groups, and other state or federal agencies. In doing so, states are relying increasingly on quality assurance requirements to help ensure the accuracy and reliability of such external data. For example, some states passed credible data or data integrity laws that establish requirements for the quality or quantity of all data used to make impairment decisions. EPA officials told us that increasing quality assurance improves the reliability of the data on impaired waters, but they cautioned that avoiding some data because of quality concerns could increase the risk of not being able to identify some impaired waters.

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## Quality Assurance Programs Designed to Support Impairment Decisions

Quality assurance programs for environmental data are designed to provide assurance that the data are of sufficient quality and quantity to support impairment decisions. As recipients of EPA funding, states are required to have both a quality management plan and quality assurance project plans to help ensure the validity of impairment decisions. A quality management plan is a management tool that documents an organization's system for planning, implementing, documenting, and assessing its environmental data collection and assessment methods. Within the overall plan, an organization develops project-specific quality assurance project plans that serve as a "blueprint" for data collection, handling, analysis, and management on that particular project. EPA has guidelines for states to follow in designing both their quality management plans and their project plans.

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A key element of quality assurance for environmental data, including water quality data, is the use of standard operating procedures for data collection and analysis. Standard operating procedures involve specific activities to manage a data collection project, collect and handle water samples, analyze the samples, and manage the resulting database. These procedures demonstrate that the data created and used by the states are scientifically valid, legally defensible, and credible. For example, one procedure to assure the integrity of the data is to have a “chain of custody” for water samples, if a chemical analysis is to be undertaken. This chain of custody is evidence that the water samples could not be tampered with or tainted. Another example of a procedure to assure the quality of a water sample is the calibration of testing instruments.

The use of standard sampling procedures, in particular, is important to provide accurate data for impairment decisions. For example, because its previous methods were determined to be inadequate, USGS developed stringent procedures to sample for trace metals and EPA has recommended that these procedures be used by states. However, according to USGS and EPA officials, states have the flexibility to select their sampling and data analysis procedures and not all states use the more stringent methods. According to the officials, the stringent methods are more intensive and expensive and could place a burden on state monitoring programs. According to USGS officials, the purpose of its stringent procedures is to discover the specific amounts of trace metals in a water body to depict current conditions and allow for delineation of trends in water quality. On the other hand, states may only need to know if their standards or criteria are met, and those criteria levels may be much higher than the actual concentrations measured by USGS methods. The officials also said that states can use alternative procedures if they collect quality control data for their water samples. Such quality control data include a variety of “blank” tests, which are samples that can be used to identify whether any contaminants are coming from the sampling equipment, such as the containers, filters, and fixatives used to collect samples.

According to an EPA monitoring official, the most important and challenging quality assurance issue that states face is the sufficiency of their monitoring networks and the amount of data available to make impairment decisions. For each water body sampled, states need to have a sufficient number of samples to support an impairment decision. However, because of the large number of waters that states need to monitor and the fact that the waters need to be sampled several times, the states are often constrained in the number of samples they can take for each one.

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According to USGS officials, sampling is sometimes complicated by the need to take samples at different times. Depending on the pollutant, water samples need to be taken at various times of the day to reflect different physical conditions in a water body. For example, dissolved oxygen fluctuates naturally during a 24-hour cycle and as a result, samples taken at different times of the day will likely provide different levels of dissolved oxygen.

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### Water Quality Data Are Increasingly Subjected to Quality Assurance Requirements

States have had quality assurance programs in place for their own data for several years. As recipients of federal funds for water quality monitoring, states are required to have such programs for their own data gathering efforts. Officials in 14 of the 15 states represented in our interviews said that they have procedures that must be followed during their own state monitoring efforts. Officials from the remaining state said that much of its work is contracted out or granted to groups that use quality assurance steps. State officials said that their procedures were documented in manuals and guidance. EPA officials stated that the states' efforts to increase quality of data will result in more credible listings, but that states should continue to consider existing and readily available data and be wary of rejecting any data that may indicate that an impairment exists.

### Data Gathered From External Sources

States are considerably more wary about the quality of the data that they use from external sources. While states generally do not require external groups to follow their own data collection procedures, they have become increasingly concerned about the quality of data that external groups submit and are therefore asking them to document their quality assurance procedures. Officials from most of the 15 states contacted told us that they attempt to assess the quality of the data presented from external sources. Officials from eight states said they require that data from other sources be accompanied by a quality assurance plan and that if no quality assurance plan is submitted with the data, they do not use that data. Some other state officials that we interviewed said that, while they do not require the submission of a quality assurance plan or the use of specific collection procedures, they do require the analysis of the samples to be done by a state certified lab. Officials from one state mentioned that they are comfortable with data obtained from either federal or other state agencies because they are familiar with the agencies' data collection methods and accept the data accordingly.

As a result of their concern over the quality of data, many states limit the data they use from outside sources. Officials from 7 of the 15 states told us that there are some sources of data that the state will not use to make

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listing determinations, including voluntarily collected data. The officials in the remaining states said that they do not limit sources of data, but may eliminate data that are not of sufficient quality for listing purposes.

Officials from 5 of the 15 states said that they use external data to a “minor” or “very minor extent.” For example, South Carolina makes most of its impairment decisions based on its own state data, in part because it does not receive much external data. Only three states use data from external sources to a “great” or “very great” extent. For example, Georgia accepts most external sources of data, including data from universities, state and federal agencies, and local governments. Utah, through its cooperative monitoring program with local, state, and federal entities, also attempts to use many of the monitoring data provided by external sources.

Even when state officials decline to use data from external sources to make listing decisions, they sometimes find it useful as a “trigger” for further monitoring work. Officials from 8 of the 15 states said they use external sources to identify potentially impaired areas in which to conduct future state monitoring and assessment efforts.

## State Data Integrity Laws

In light of states’ increased concerns over the quality of data used to make important impairment decisions, we identified seven states nationwide that have passed data integrity laws that establish requirements for the quality or quantity of data used to make these decisions. Many states use EPA guidance that provides that waters with 10 percent of the data showing an exceedance of a criterion can be listed as impaired. After passing such a law in 2000, Florida has since written state regulations providing that the state should have at least 20 data points to make an impairment decision. In addition, the regulations establish the number of exceedances that are needed to declare a water impaired. For example, the regulations require that at least 5 samples should exceed the water quality standard for a water with 20 samples overall. Arizona’s regulations require that state water quality officials use only “reasonably current, credible, and scientifically defensible data.” Data are considered credible and scientifically defensible if appropriate quality assurance and control procedures were used and documented in collecting data. Virginia’s law requires the state water quality officials to consider reasonable data as data that are no older than 5 years. Wyoming’s law requires the state to have three types of data—chemical, physical, and biological—in order to list a body of water as impaired.

## Balancing Data Availability and Quality Control

EPA officials told us that, overall, the data quality improvements states are seeking are appropriate. They cautioned, however, that the need for

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quality must be balanced with the requirement under regulations to use all readily available data as part of the assessment of water quality. Under EPA's regulations for listing impaired waters, states are to consider all readily available data as they assess the quality of their waters. However, increasing standards of data quality may result in the rejection of some data, with the risk that some impaired waters might not be identified. State and EPA officials suggested that the preferred way to handle data that do not meet quality assurance standards is to use the data as a trigger for follow-up monitoring, as some states appear to be doing based on our interviews. Furthermore, EPA and some state officials indicated that data from external sources can extend the state's monitoring resources. Accordingly, they have sought to establish guidance and training for volunteer monitoring programs. For example, Massachusetts has developed guidance for volunteer monitors and uses quality assured data gathered by these groups along with its own data to make decisions about whether or not waters are impaired and should be on the 303(d) list. Where data quality is questionable, Massachusetts identifies the segment in its water quality assessment reports for additional follow-up monitoring to confirm and document the impairment.

The National Research Council report supports the idea of using lower-quality data to identify states' monitoring needs. The report addressed the issue of data quality by suggesting that a "preliminary list" of waters be developed to report waters suspected of being impaired and needing further monitoring. The Council states that in situations where minimal data or evaluated data are available, the data may not be sufficient for listing a body of water as impaired but may be valuable for identifying potentially impaired waters. As noted previously, EPA's Integrated Listing guidance incorporates the concept of different lists and also recommends that states develop a monitoring strategy to deal with waters for which sufficient data do not exist. Officials from two-thirds of the 15 states that we interviewed agreed that such a list would be useful as a way to deal with uncertain data. Officials from the remaining states cautioned that the list may not be a good idea. One state said that it could be perceived as a requirement to monitor the waters, which could create a burden on state monitoring programs and resources.

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## Reliability of EPA's Impaired Waters Database Limited by Inconsistent Data

Owing, in part, to the inconsistencies in states' approaches to identifying impaired waters, the information in EPA's database of impaired waters is of questionable reliability. EPA has incorporated the states' data on impaired waters into a large database and has recently made this information available to policymakers and the public over the Internet. In addition to the inconsistencies in the ways that states identify their waters as impaired, there are inconsistencies in how states report critical information to EPA for inclusion in the database. In some cases, EPA's database and the information portrayed on its Web site contain inaccuracies. One-third of state officials we interviewed said that EPA's Web site did not portray their state's data accurately.

EPA has undertaken efforts to improve the public's access to information on impaired waters nationwide by upgrading its Internet capabilities. Specifically, EPA has used the data on impaired waters submitted by the states to create a large database of information, called the TMDL Tracking System, which is one of the databases used by the Watershed Assessment, Tracking, and Environmental Results (WATERS) system. Both the TMDL database and WATERS are used to convey information on EPA's Web site. The TMDL database includes data related to states' listings, the causes of impairment, court decisions related to the lists, TMDL schedules, and other information necessary to understand the status of states' listings and TMDL programs. The database can be used to generate summary reports on the impaired waters of a state. The TMDL database is linked to WATERS, which enables the data to be displayed on maps. WATERS unites water quality information previously available only on individual state agency homepages and in several EPA databases that support EPA's Web site. In the future, EPA plans to include additional information, such as no discharge zones and monitoring stations.

With any such system, the information presented can be only as good as the data entered into the supporting database. Accordingly, inconsistencies in the data submitted by states, as well as inaccurate data in some cases, raise questions about the reliability of the TMDL database and of WATERS.<sup>9</sup> Of greatest consequence, the variation in states' standards, monitoring, assessment, and listing practices, as discussed previously, results in inconsistencies in EPA's database. For example, the wide variation in states' monitoring programs means that states have

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<sup>9</sup> Data are deemed to be "reliable" if they are sufficiently complete and error free to be convincing for their purpose and context.

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widely different bases upon which to make impairment decisions, resulting in varying numbers of impaired waters among states. Such inconsistencies help to explain why the numbers of waters identified as impaired by states range from as low as 37 for one state but exceed 1,000 for several others. These inconsistencies also make it difficult to aggregate data from individual states into a national picture or to compare the quality of waters from one state to the next.

Variations in how states report critical data to EPA for incorporation into the TMDL database also undermine its reliability. Because states identify the size of impaired waters differently, EPA's tally of both the total number of impaired waters nationwide and the number of TMDLs that must be established is not reliable. More specifically, some states submit lists that count several small segments of a river or stream as individually impaired waters, while others submit lists that count larger segments of a river or stream as impaired. Illinois, for example, breaks the Mississippi River into many segments, while Missouri breaks the Mississippi River into three segments. As another example, Indiana's impaired water segments for one river were reported separately by EPA for each impairment, while Illinois' impaired water segments for the same river were listed once, with all impairments noted under the single listing. As a result, according to an Indiana water official, the state may therefore appear to have more impaired water segments than it actually does. This variation may be alleviated by EPA's Integrated Listing guidance. As recommended by the National Research Council, the guidance encourages states to use one georeferencing system, called the National Hydrography Dataset, to define the waters within their borders.

Because states currently use a number of different ways to define their waters, when EPA transfers their data into the WATERS system, errors may result in the presentation of the information on the Web site. Overall, less than one-third of the state water quality officials that we interviewed told us that their state's water quality is reflected "somewhat" or "very" accurately on the EPA Web site. A Connecticut water quality official explained that the state's water quality is inaccurately reflected on EPA's Web site as a result of a scaling problem. The official explained that while there are waters in Connecticut that are impaired for very localized areas, the EPA Web site depicts that impairment over a much larger area, thereby overestimating the problem area and giving the public the sense that the problem is bigger than it truly is. Similarly, Massachusetts uses smaller-scale watersheds to identify impaired waters, and EPA uses larger-scale watershed data. This results in the waters in Massachusetts being listed at the aggregate level, thus inappropriately documenting the geographical

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extent of the problem. This oftentimes results in giving the sense of a larger problem than the one conveyed by the state and will mask multiple problems within a smaller geographical area. EPA officials said that the agency attempts to present states' data as submitted to avoid misrepresenting the information, and that the agency provides states with the opportunity to review and revise the database information. They further noted that this issue may be resolved by the states using the National Hydrography Dataset.

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## Conclusions

States need some degree of flexibility in the way they list their impaired waters to account for their particular ecological conditions and other unique characteristics. Indeed, some flexibility in key listing-related functions, such as the adoption of water quality standards and water quality monitoring, is provided under both the Clean Water Act and EPA regulations. However, flexibility currently exists beyond what is needed to address local ecological characteristics or other differences. States have developed varied approaches to setting water quality standards, monitoring water quality, and assessing water quality data to make listing determinations. States have also developed inconsistent methods and justifications for removing waters from their lists, based in part, on inconsistent interpretations of EPA guidance by EPA regions. Moreover, current EPA policy has allowed wide disparities in how states describe their methodologies for identifying and listing impaired waters.

The inconsistency in state approaches is most apparent in bodies of water that are shared by neighboring states but which are often listed differently by them. Such inconsistencies can engender doubt about the accuracy of the listings and states' abilities to correctly identify impaired waters. If states cannot correctly identify impaired waters, they cannot efficiently channel efforts or resources to develop TMDLs for improving water quality. While the problem of inconsistent interstate listings has been clearly demonstrated, few states have received any guidance or assistance from EPA on how to address it. Many have indicated that EPA can usefully serve as a mediator and/or facilitator in helping states to work together in making listing decisions on such waters.

In its regulatory role, EPA needs to be able to ascertain the nature and extent of impairments on a national level and to provide a coherent picture of water quality to policy makers and the public. Inconsistent state approaches have undermined EPA's ability to provide such a picture. We acknowledge the inherently difficult problems EPA faces in presenting an accurate picture of states' impairment data, and its efforts to address



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them. While EPA has undertaken significant efforts to convey information about impaired waters over the Internet, this information is potentially misleading in its current state and will be of limited value until EPA improves the reliability of the data.

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## Recommendations for Executive Action

To provide greater consistency in the way states list their impaired waters, we recommend that the Administrator, EPA,

- provide additional guidance to the states on carrying out the key functions (including standard-setting, water quality monitoring, and data assessment) that influence how states identify the waters for their section 303(d) lists;
- work with the agency's regional offices to ensure a more consistent interpretation of the agency's policies on the criteria that states must meet to remove waters from their section 303(d) lists;
- provide clear guidance to the states on the information they should use to describe their methodologies for developing their section 303(d) lists; and
- work with the states to help resolve discrepancies that arise in the listing of interstate waters. In pursuing such a role, the agency could benefit from the activities of the nation's river basin commissions, which are already attempting to assist their states in making interstate listing decisions.

In addition, until EPA's Office of Water resolves problems relating to inaccurate and/or misleading data contained in its WATERS database, we recommend that the Administrator direct that office to explain clearly and visibly to users of its impaired waters Web site the potential misinterpretations that may arise from its current presentation of these data.

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## Agency Comments and Our Evaluation

We provided EPA and the Department of the Interior with a draft of this report for review and comment. EPA did not submit a formal letter but did provide comments from officials in the agency's Office of Water. Overall, the officials said that our treatment of the issues raised in the report accurately reflects discussions we have had with Office of Water officials and that our recommendations are reasonable. The officials also described initiatives under way that are germane to our recommendations concerning the need to (1) increase greater consistency in how states list their waters and (2) convey to users of EPA's impaired waters Web site the potential misinterpretations that may arise from the site's current presentation of listing data.

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Regarding consistency of listings, EPA noted that it recently distributed to the states and regions its 2002 Integrated Water Quality Monitoring and Assessment Report guidance. EPA expects this guidance to reduce the inconsistencies in state practices for monitoring their waters, characterizing their water quality standards attainment status, and identifying those waters requiring the establishment of TMDLs. EPA also pointed out that the states' development of integrated reports will provide a much clearer summary of the quality of the nation's waters. While we agree that the integrated report will provide a useful summary of states' water quality and will likely reduce inconsistencies in how they report on the quality of their waters, we do not believe that the integrated reporting guidance will help significantly in reducing inconsistencies in states' approaches for identifying impaired waters. In particular, the guidance does not address the key functions that most influence how states interpret their water quality standards, monitor their waters, and assess the water quality data used to identify impaired waters.

On the other hand, EPA's draft Consolidated Assessment and Listing Methodologies guidance (CALM) has the potential to more directly address sources of inconsistency. Specifically, the guidance seeks to encourage states to improve their assessment and listing methodologies and, in the longer term, strengthen their monitoring programs. The guidance also has the potential to address inconsistencies in states' water quality monitoring and assessment practices, and in how they describe their approaches through the methodologies they submit to EPA along with their 303(d) lists. However, as of December 2001, the CALM guidance had not yet been published.

EPA did not comment directly on our recommendation that it should work with its regional offices to ensure a more consistent interpretation of the agency's policies on removing waters from their 303(d) lists. We note, however, that the need for consistent regional interpretation of the agency's delisting guidance will grow significantly in the future under the agency's new Integrated Listing guidance. Specifically, only the fifth of five categories of waters in EPA's new categorization process is considered to be the 303(d) list. EPA expects that states will transfer waters from this category to other categories, with significant implications for which state waters will be targeted for TMDL development. As such, it will be essential that EPA's guidance on these decisions be interpreted consistently from one region to another. EPA also did not comment directly on our recommendation that it should work with states to help resolve discrepancies that arise in the listing of interstate waters.

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Regarding our recommendation concerning the potential misinterpretation by users of listing information on EPA's impaired waters Web site, EPA noted that it will continue to assist states in georeferencing their waters to document impairments in a consistent manner and that it will continue to update the WATERS database. In addition, EPA's Integrated Listing guidance recommends that states use one standard format for physically defining all of their waters. These efforts should help to increase the consistency of reporting the size and number of impaired waters in future lists. However, until the inconsistencies in states' approaches are resolved, the reporting of impaired waters will continue to be highly variable. For this reason, we continue to recommend that EPA explain to users the potential misinterpretations that may arise from the current presentation of the data.

In its letter dated December 13, 2001, the Department of the Interior said that our draft report "covered a complicated and detailed topic well" and that "many of the contributing factors to inconsistent state perspectives on water quality conditions are carefully identified . . . ." The letter included a number of technical comments and suggestions from the department's U.S. Geological Survey, which have been incorporated as appropriate (see app. II).

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## Scope and Methodology

To identify and assess the effects of any differences in states' approaches to identifying impaired waters, we conducted a telephone survey of the state officials responsible for developing such lists of impaired waters for 15 randomly selected states. We also reviewed and analyzed the written methodologies that each of the 50 states and the District of Columbia submitted to EPA. The methodologies are prepared by the states to explain the methods they use to decide whether waters are impaired. In addition, we identified several instances of waters that share state boundaries and appeared to be inconsistently listed by the states. We discussed these examples with EPA headquarters and regional officials to determine the reasons for the apparently inconsistent listings.

To determine how states ensure the quality of the data used to identify impaired waters, we first reviewed EPA's quality assurance guidance to determine what is required of states. We included questions on the quality assurance procedures that states use in our 15-state survey of state water quality officials. We also interviewed appropriate officials at 9 of 10 EPA regional offices to determine what procedures states in each region are following to ensure the quality of the data used to create their lists. Finally,

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we reviewed data credibility regulations written by two states and discussed them with state and regional officials.

To assess the reliability of the information in EPA's database of impaired waters, we took steps to determine the consistency, completeness, and accuracy of this information. We reviewed EPA's guidance for preparing the 303(d) report and other EPA guidance relevant to the monitoring and assessment of waters. We requested EPA to provide us specific data by state and examined the data for completeness. To determine the accuracy of EPA's WATERS Web site and other EPA sites based on the database, we requested the officials who participated in our 15-state survey to look at their state information and provide us with an assessment of how accurately the data were portrayed. We also used the Web site to attempt to gather information that would allow us to determine the nature and magnitude of the nation's water quality problems, however, we were unable to do so. We discussed these matters with EPA headquarters officials.

We conducted our work from April through November 2001 in accordance with generally accepted government auditing standards.

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As we agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of this letter. We will then send copies to appropriate congressional committees and other interested parties and make copies available to those who request them.

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If you or your staff have any questions about this report, please call me or Steve Elstein at (202) 512-3841. Key contributors to this report are listed in appendix III.

A handwritten signature in black ink, reading "John B. Stephenson". The signature is written in a cursive style with a long horizontal flourish extending to the right.

John B. Stephenson  
Director, Natural Resources and Environment

# Appendix I: Status of States' Monitoring and Assessment of Their Waters

States use a variety of monitoring practices and assessment methods; as a result, the percentage of waters monitored and assessed across states varies greatly. States report the percentage that they have monitored and assessed for (1) rivers and streams; (2) lakes, reservoirs, and ponds; (3) estuaries; and (4) ocean shorelines. Because rivers, streams, estuaries, and ocean shorelines are reported in miles, while lakes, reservoirs, and ponds are reported in acres, the percentage for each category is reported separately below, in table 1.

**Table 1: Percentage of States' Waters Monitored and Assessed**

State	Percentage of rivers and streams assessed	Percentage of lakes, reservoirs, and ponds assessed	Percentage of estuaries assessed	Percentage of ocean shorelines assessed
Alabama	5	94	100	15
Alaska	0	0	1	0
Arizona	5	22	<sup>a</sup>	<sup>a</sup>
Arkansas	10	69	<sup>a</sup>	<sup>a</sup>
California	8	44	89	57
Colorado	27	36	<sup>a</sup>	<sup>a</sup>
Connecticut	16	42	100	0
Delaware	95	94	4	100
District of Columbia	98	100	97	<sup>b</sup>
Florida	10	48	33	0
Georgia	12	94	100	0
Hawaii	100	0	100	84
Idaho	11	0	<sup>a</sup>	<sup>a</sup>
Illinois	33	61	<sup>a</sup>	<sup>a</sup>
Indiana	24	32	<sup>a</sup>	<sup>a</sup>
Iowa	14	52	<sup>a</sup>	<sup>a</sup>
Kansas	12	100	<sup>a</sup>	<sup>a</sup>
Kentucky	19	96	<sup>a</sup>	<sup>a</sup>
Louisiana	9	35	40	0
Maine	100	100	100	0
Maryland	39	27	98	100
Massachusetts	18	56	8	0
Michigan	40	55	<sup>a</sup>	<sup>a</sup>
Minnesota	13	77	<sup>a</sup>	<sup>a</sup>
Mississippi	47	58	28	55
Missouri	42	100	<sup>a</sup>	<sup>a</sup>
Montana	10	94	<sup>a</sup>	<sup>a</sup>
Nebraska	5	45	<sup>a</sup>	<sup>a</sup>
Nevada	1	60	<sup>a</sup>	<sup>a</sup>
New Hampshire	24	95	100	100

**Appendix I: Status of States' Monitoring and Assessment of Their Waters**

<b>State</b>	<b>Percentage of rivers and streams assessed</b>	<b>Percentage of lakes, reservoirs, and ponds assessed</b>	<b>Percentage of estuaries assessed</b>	<b>Percentage of ocean shorelines assessed</b>
New Jersey	59	44	100	100
New Mexico	4	15	<sup>a</sup>	<sup>a</sup>
New York	100	100	100	100
North Carolina	89	100	100	0
North Dakota	22	97	<sup>a</sup>	<sup>a</sup>
Ohio	10	0	<sup>a</sup>	<sup>a</sup>
Oklahoma	14	57	<sup>a</sup>	<sup>a</sup>
Oregon	47	94	26	0
Pennsylvania	15	0	<sup>a</sup>	<sup>a</sup>
Rhode Island	54	75	100	100
South Carolina	65	58	32	0
South Dakota	32	18	<sup>a</sup>	<sup>a</sup>
Tennessee	88	100	<sup>a</sup>	<sup>a</sup>
Texas	7	50	100	<sup>b</sup>
Utah	10	96	<sup>a</sup>	<sup>a</sup>
Vermont	16	7	<sup>a</sup>	<sup>a</sup>
Virginia	39	93	99	0
Washington	98	53	85	0
West Virginia	24	96	<sup>a</sup>	<sup>a</sup>
Wisconsin	40	65	<sup>a</sup>	<sup>a</sup>
Wyoming	87	0	<sup>a</sup>	<sup>a</sup>

<sup>a</sup>State does not have estuaries or ocean shorelines.

<sup>b</sup>This information was not available.

Source: EPA's 305(b) report for 1998.

# Appendix II: Comments From the Department of the Interior



## United States Department of the Interior

OFFICE OF THE SECRETARY  
Washington, D.C. 20240

DEC 13 2001

Mr. John B. Stephenson  
Director, Natural Resources and  
Environment  
United States General Accounting Office  
Washington, D.C. 20548

Dear Mr. Stephenson:

Secretary Norton provided me a copy of your draft report entitled, "Inconsistent State Approaches Complicate Nation's Efforts to Identify Its Most Polluted Waters" (GAO-02-186) to review. As you know, staff of the U.S. Geological Survey (USGS) were contacted by your office to provide information.

While there are no recommendations for the USGS, the USGS staff has provided the following comments:

Overall, we have found that you have covered a complicated and detailed topic well. Many of the contributing factors to inconsistent State perspectives on water-quality conditions are carefully identified, and examples are given to clarify what you have understood. We think this document will serve many of your readers well.

We have some specific comments that we hope will help you further clarify the points you are making.

Page 2.

"Variation among the States stems from a combination of factors including differences in the (1) water quality standards for determining which waters . . ." All four of the points made are necessary to understand the inconsistency between States on water-quality conditions. One additional issue could be mentioned and that is the determination States make of what the specific beneficial uses are. Even if States use consistent methods for standards, monitoring, assessment, and get consistent guidance on removal of listed reaches, if they do not agree on the beneficial uses for water bodies, their conclusions on impairment will be different. You point out several examples (pages 17-19) where one State sees the water in the same river as a drinking water source another State does not, leading to different standards and perspectives.

Page 4. Footnote #2.

The note indicates that impaired waters that have or are expected to have technological controls in place to meet standards do not need a Total Maximum Daily Load (TMDL). If there is a time



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period over which the impaired waters are expected to meet standards, thus avoiding the need for a TMDL, please state what time frame is specified.

Page 5.

First full paragraph discusses when 303(d) lists were due (October 1, 2002), but, in August 2001, the effective date was postponed, allowing 18 months for public review of revised regulations. Is there a currently identified due date for the 303(d) lists? Will the new November 2001 guidance state what the due date is to be?

Page 9.

In the last paragraph: "USGS officials recommend that States utilize all three types of monitoring to help ensure that water quality conditions are adequately characterized." Consider adding: USGS officials suggested that, although the endpoint of monitoring for States may be the biological condition, if a State decides to obtain a different biological outcome than the one they find, a new biological condition will be obtained by adjusting the physical or chemical conditions.

Page 10.

In the figure, consider adding a few additional measures that are key to monitoring. For example: Under biological, indicator bacteria; under physical, flow; and under chemical, dissolved oxygen. These additions point to two of the frequent reasons for 303(d) listing of streams (bacteria, oxygen) along with suspended solids and nutrients already listed. Flow is important because flow conditions can identify times when contaminants have been either diluted or concentrated at a stream site. Also, flow information is ultimately required to establish TMDLs.

Page 11. Footnote #7.

Consider that probability-based monitoring is important to efficiently identify the overall condition of waters in a State as stated; however, while the results will provide the percentage of all waters in the State that exceed a criteria, the probability monitoring will not identify specifically where the reaches are that exceed the criteria. Thus, both probability and targeted monitoring are needed for 305(b) and 303(d) requirements.

Page 23.

First paragraph: "According to USGS officials, the purpose of its stringent procedures is . . . ." Consider that statement could be rewritten: According to USGS officials, the purpose of its stringent procedures is to discover the specific amounts of trace metals in a water body depicting current conditions and allowing for quantification of water-quality time trends. On the other hand, States may only need to know if their standards or criteria are met, and those criteria levels may be much higher than the actual ambient concentrations measured by the USGS methods.

Mr. John B. Stephenson

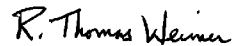
3

Page 27.

In the paragraph discussing the accuracy of data in the TMDL database and WATERS, consider that, in addition to the reasons stated in this paragraph for inconsistency between States listings, you also demonstrate on pages 17-19 that one of the additional reasons for variations between States is that States designate different beneficial uses for waters. The different uses will lead to variations between States in listing waters even if they use consistent methods for monitoring, criteria setting, and analysis for impairment decisions.

Thank you for the opportunity to review and to comment on the draft report before it is finalized.

Sincerely,



*for* Bennett W. Raley  
Assistant Secretary for Water and Science

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# Appendix III: GAO Contacts and Staff Acknowledgments

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## GAO Contacts

John B. Stephenson (202) 512-3841  
Steve Elstein (202) 512-6515

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## Staff Acknowledgments

In addition to those named above, Aaron Alton, Susan E. Iott, Nathan A. Morris, and Barbara L. Patterson made key contributions to this report. Also contributing to this report were Nancy Crothers, Barbara Johnson, Karen Keegan, Trish McClure, and Cynthia Norris.

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