Executive Summary

The Quality of Our Nation's Water

Background

The *National Water Quality Inventory Report to Congress* is the twelfth biennial report to Congress and the public about the quality of our nation's rivers, streams, lakes, ponds, reservoirs, wetlands, estuaries, coastal waters, and ground water. This report is prepared under Section 305(b) of the Clean Water Act. Section 305(b) requires states and other jurisdictions to assess the health of their waters and the extent to which water quality supports state water quality standards and the basic goals of the Clean Water Act. This information is submitted to the U.S. Environmental Protection Agency (EPA) every 2 years and summarized in the biennial report to Congress.

States' Section 305(b) assessments are an important component of their water resource management programs. These assessments help states

- Implement their water quality standards by identifying healthy waters that need to be maintained and impaired waters that need to be restored
- Prepare their Section 303(d) lists of impaired waters
- Develop restoration strategies such as total maximum daily loads and source controls
- Evaluate the effectiveness of activities undertaken to restore impaired waters and protect healthy waters.

EPA and the states continue to work to improve these assessments through better and more extensive monitoring. Our goal is comprehensive monitoring of all waters. This is a challenging task given the demands placed on limited state and federal resources. However, this is a vital goal given the important, and costly, water resource management decisions based on state water quality monitoring data. This report reflects incremental progress toward the goal of comprehensive assessment. It includes information submitted by all 50 states and the District of Columbia and 5 territories, 4 interstate commissions, and 9 Indian tribes.

Beverly Manifold, Okeefenoke Swamp, GA

How Do States and Other Jurisdictions Assess Water Quality?

Water quality assessment begins with water quality standards. States and other jurisdictions adopt water quality standards for their waters. These standards must then be approved by EPA before they become effective under the Clean Water Act.

Water quality standards have three elements. First are the designated uses assigned to waters. The Clean Water Act envisions that all waters be able to provide for swimming and the protection and propagation of aquatic life. Additional uses described in the Act and adopted by states include drinking water and fish consumption. Second are the criteria. Criteria help protect designated uses. For example, criteria include chemical-specific thresholds that protect fish and humans from exposure to levels that may cause adverse effects. The third element is called the antidegradation policy. This policy is intended to prevent waters from deteriorating from their current condition.

After setting standards, states assess their waters to determine the degree to which these standards are being met. Currently, states use two categories of data to assess water quality. The first and most desirable category is monitored data. These data are field measurements that are not more than 5 years old. They include field measurements of biological, habitat, toxicity, and/or physical/chemical conditions in waterbodies, sediments, and fish tissue. The other category frequently used to fill information gaps is evaluated data. Evaluated data include field measurements that are more than 5 years old and estimates generated using land use and source information, predictive models, and surveys of fish and game biologists.

How Many of Our Waters Were Assessed for 1998?

This report does not describe the health of all waters of the United States because states have not yet achieved comprehensive assessment of all their waters. States assessed almost 25% of the nation's total river and stream miles; 40% of its lake, pond, and reservoir acres; and 30% of its estuarine square miles for this edition of the biennial report.

Therefore, this report summarizes the health of only that portion of waters that states reported on in their individual 1998 water quality inventories.

States reported fairly significant increases in the amount of rivers and streams assessed between 1996 and 1998. Assessed river and stream miles increased by 21% from 694,000 to over 842,000 miles. This is considerable when you realize that only 1.3 million river and stream miles are perennial waters that flow year round. The remaining 2.3 million miles or so are intermittent or ephemeral, which means they are dry for some or most of the year.

EPA and states recognize that, in spite of the progress made toward comprehensive assessment, we still have a long way to go. Oceans, wetlands, and ground water quality are poorly represented in state monitoring programs. EPA's wetland and ground water protection programs continue to work with states to develop assessment methods and improve monitoring coverage. EPA is initiating a coastal monitoring program, Coastal 2000, that will provide a baseline characterization of coastal waters and data needed to develop water quality standards for these waters.

What Is the Status of Our Assessed Waters?

States focused the majority of their assessment activities on rivers and streams; lakes, ponds, and reservoirs; and estuaries. States reported that 65% of assessed river and stream miles, 55% of assessed lake acres, and 56% of assessed estuarine square miles fully support the water quality standards states evaluated. The remaining assessed waters are impaired to varying degrees. The amount of assessed waters identified as impaired changed somewhat between 1996 and 1998. However, states indicated that these differences more likely reflect changes in monitoring design, assessment methodology, and water quality standards than actual water quality changes.

The states bordering the Great Lakes report on almost 90% of their Great Lake shoreline. The assessments indicate that one or more uses is impaired for about 4,700 shoreline miles. Much of this impairment is due to historic contamination by persistent pollutants that still impact fish consumption.

States assessed very small amounts of ocean and marine resources, wetlands, and ground water. This is due in part to a lack of water quality standards and other assessment tools for these resources. EPA and states are working to develop water quality standards and improve characterization of these resources.

What Do States Identify as the Leading Causes and Sources Affecting Impaired Waters?

For the subset of assessed waters identified as impaired, the report presents the leading pollutants and sources of pollution reported by states, territories, commissions, and tribes. In terms of the nature of impairment, the bottom line did not change significantly from 1996 to 1998. For example, across all waterbody types, states and other jurisdictions reported that

- Aquatic life, swimming, and fish consumption are among the top impaired uses.
- Siltation, nutrients, bacteria, and metals are among the top pollutants causing impairment.
- Pollution from urban and agricultural land that is transported by precipitation and runoff (called nonpoint source pollution) is the leading source of impairment.

It is important to understand the difficulties in identifying causes and, in particular, sources of pollution in impaired waters. For many waters, states and other jurisdictions classify the causes and sources as unknown. EPA and states are working to develop methodologies for both determining the causes and sources of impairment and describing the level of confidence in the classification.

How Does Impaired Water Quality Impact Public Health and Aquatic Life?

Water quality standards are adopted to protect public health and aquatic life. Specifically, water quality standards establish conditions designed to ensure that

- Water quality supports a balanced population of fish, shellfish, and wildlife
- Water is safe to use for drinking water, fish consumption, swimming and recreation, and other beneficial uses.

When waters do not meet water quality standards, one or more of these uses are impaired. Depending on the nature of the impairment, this may mean that certain public uses must be restricted. For example, fish consumption may be prohibited or restricted, beaches may be closed to swimming, and drinking water utilities may have to install more costly treatment devices. Toxic chemicals, as well as viruses and bacteria, threaten human health through the consumption of contaminated fish and shellfish or through contact with contaminated waters.

Toxic chemicals, bacteria, and viruses may also impact aquatic life. In fact, aquatic organisms are more sensitive than humans are to some chemicals. In severe cases, exposure can kill aquatic organisms. Lower levels of exposure can cause deformities and sores and can reduce the reproductive success of organisms. Aquatic life is often impaired by loss of in-stream habitat for organisms and by conventional problems such as low dissolved oxygen, siltation, and excess nutrients. While extremely low dissolved oxygen can result in fish kills, these problems usually exhibit less dramatic, but more long-term, impacts on aquatic life. These stressors result in alteration or loss of the biological integrity of aquatic communities.

What Is Being Done To Restore and Maintain Water Quality?

Public polls consistently document that Americans value water quality. In addition to its economic benefits, clean water provides recreational and aesthetic benefits. As a result, local, state, and federal agencies; the private sector; and other organizations are working to improve water quality. According to President Clinton's *Clean Water Act Initiative: Analysis of Costs and Benefits* (EPA800-S-94-001, 1994), these partners spend between $63 billion and $65 billion dollars each year to improve and protect water quality.

This study estimated that private sources spend a combined total of about $30 billion per year on pollution prevention and control efforts. Agriculture spends another $500 million per year on activities that reduce its impact on water quality including implementation of best management practices to control the effects of nonpoint source runoff. Municipalities spend a total of $23 billion per year, primarily on wastewater treatment plants, drinking water treatment, and storm water pollution control.

State and federal governments dedicate almost $500 million and $10 billion, respectively, to water resource protection and restoration efforts each year. These efforts include developing and revising water quality standards, monitoring and assessing water quality, characterizing causes and sources of impairment, developing total maximum daily loads and allocating these loads to point and nonpoint sources, implementing permitting programs to address point sources, and developing and implementing best management practices to control nonpoint source pollution.

Significant resources are dedicated to restoring and maintaining water quality. Water quality monitoring and assessment is a critical tool to help ensure that these resources are used effectively to achieve water quality goals. EPA and state environmental agencies recognize that water quality monitoring and assessment programs need continued strengthening to be able to evaluate the effectiveness of water quality protection and restoration efforts.


John H. McShane, Buttermilk Falls State Park, NY


Conrad Conero, Braden Brook, Greenfield Park, NY

Introduction

The *National Water Quality Inventory Report to Congress* is the primary vehicle for informing Congress and the public about the quality of water in our nation's rivers, streams, lakes, ponds, reservoirs, wetlands, estuaries, and coastal waters. This document characterizes waters by their capacity to meet water quality standards established by states, territories, and tribes. The Clean Water Act grants states the authority and responsibility for establishing water quality standards and sets a national goal that all waters will, at a minimum, achieve the basic goals of supporting healthy aquatic communities and allowing swimming and other recreational activities.

Section 305(b) of the Clean Water Act requires states and other jurisdictions to assess the health of their waters and the extent to which their waters support water quality standards, including the basic goals of the Clean Water Act. In addition, Section 305(b) requires states to identify the contribution of nonpoint sources to water quality impairment. It also calls for an analysis of the social and economic costs and benefits of achieving the goals of the Clean Water Act. Section 305(b) specifies that states submit reports describing water quality conditions to the U.S. Environmental Protection Agency (EPA) every 2 years. Section 305(b) also requires that EPA summarize the reports submitted by the states and other jurisdictions and convey the information to Congress biennially. This report, the twelfth in a series published since 1975, satisfies the reporting requirements in Section 305(b) of the Clean Water Act.

This report is organized into two major sections. Part I presents the national assessment. The information reported by the 50 states and the District of Columbia, 5 territories, 4 interstate commissions, and 9 tribes is compiled for each type of waterbody and presented in Chapters 3 through 7 of this report. These national summaries identify the portions of waters that were assessed and, of those assessed, the portions found to be supporting the water quality standards and the portions that are impaired. Each chapter also describes the most widespread causes and sources of water quality problems emerging from the information reported. The final chapter in Part I addresses the costs and benefits of achieving the goals of the Clean Water Act.

Part II includes two-page fact sheets that summarize the information reported by each jurisdiction. The first chapter in Part II summarizes recommendations provided by states on improving water resource management and the assessment process. The full report submitted by a jurisdiction is available from the point of contact named on its fact sheet.

This report is a compilation of information submitted in individual

The Clean Water Act of 1972

. . . it is the national goal that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water . . .

1998 water quality inventories by states, territories, interstate commissions, tribes, and the District of Columbia. The water quality information contained in this report reflects their efforts to assess their waters against their water quality standards. It is important to note that the states, tribes, and other jurisdictions do not use identical methods to rate their water quality nor are their water quality standards identical.

States exercise flexibility provided in the Clean Water Act and in EPA regulations when they establish water quality standards and assess attainment of those standards. This flexibility is important because there are natural variations among waters across the United States. Variations in location determine the type of fish communities that waters support. Variations in geology influence the natural chemistry of the water, which, in turn, influences the toxicity and bioavailability of pollutants entering the water from human activities.

There is a trade-off between flexibility and consistency. Without consistent monitoring and assessment methods in place, EPA and states cannot compare data over time to identify trends in water quality. For example, states and other jurisdictions may modify their standards or assess different waterbodies from one reporting period to the next. Similarly, it is difficult to compare data from one state to another because they may use different indicators to assess attainment of water quality standards and are quite likely to have different standards.

For more than 10 years, EPA has been working with states to pursue a balance between flexibility and consistency in the Section 305(b) assessment process. The most recent development in this process was the publication in September 1997 of the revised *Guidelines for Preparation of Comprehensive Water Quality Reports*. These guidelines reflect the recommendations of the National 305(b) Consistency Workgroup, which is made up of states, other jurisdictions, and EPA. This 1998 Report to Congress is the first report since the new guidelines were published. The workgroup intends that these guidelines will be in effect for both the 1998 and 2000 reporting cycles. A few key elements of the revised guidelines are

- Comprehensive assessments of all waters and all applicable standards
- Electronic reporting of water quality assessment data
- Georeferencing assessed waters so that both healthy and impaired waters can be located on a map
- Documenting the quality of data used to support assessments.

EPA and the states recognize the need to continue to improve the water quality assessments reported under Section 305(b). Increasingly, these assessments are used to identify and prioritize water quality problems within states. For example, Section 303(d) of the Clean Water Act calls for each state to develop a list of impaired and threatened waters. These are waters that do not or are not expected to meet water quality standards after implementation of water pollution controls. The Section 305(b) assessments are the primary tool for identifying these waters and the pollutants contributing to impairment.

After preparing 303(d) lists, states develop total maximum daily loads (TMDLs). A TMDL is the amount of a pollutant the waterbody can accept and still meet water quality standards. The difference between the TMDL and the current load to the waterbody is the amount of pollutant that must be reduced by pollutant sources (both point source discharges and nonpoint source runoff).

Unified Watershed Assessments also rely heavily on the state 305(b) assessments. In an effort to promote holistic, watershed-based problem solving, the Clean Water Action Plan called for states to work with local and federal partners and identify watersheds most in need of restoration or protection. In addition to 305(b) assessments and 303(d) lists, states use information on wildlife and fisheries, forestry, agriculture, and land use in defining priorities for watershed restoration.

The Index of Watershed Indicators (IWI) is another tool that uses the 305(b) assessment results. In the past, IWI was a discrete tool used to look at national watershed health. It is evolving toward a set of data layers that includes 305(b) assessment results, the 303(d) lists of impaired waters, and other national and local information.

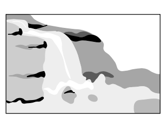
EPA and state water programs are currently working on sequencing water quality monitoring to determine water quality standards (WQS) attainment/nonattainment so that it better supports the full range of water quality management activities. The sequence of activities consists of

- Characterizing waters for the 305(b) assessment
- Using the subset of waters identified as not supporting WQS to develop 303(d) lists
- Identifying source contributions
- Developing TMDLs
- Implementing source controls
- Performing followup monitoring to evaluate the effectiveness of source controls and to track trends in water quality improvements.

Waters of the United States

Integrated water quality management begins with a basic understanding of how water moves through the environment, comes into contact with pollutants, and transports and deposits pollutants. The water cycle depicted on page 6 illustrates the general links between the atmosphere, soil, surface waters, ground waters, and plants.

The United States has diverse water resources. The major types of water resources assessed by states and covered in this report are described below.



Rivers and Streams

Rivers and streams are characterized by flow. **Perennial** rivers and streams flow continuously, all year round. **Intermittent** or ephemeral (nonperennial) rivers and streams stop flowing for some

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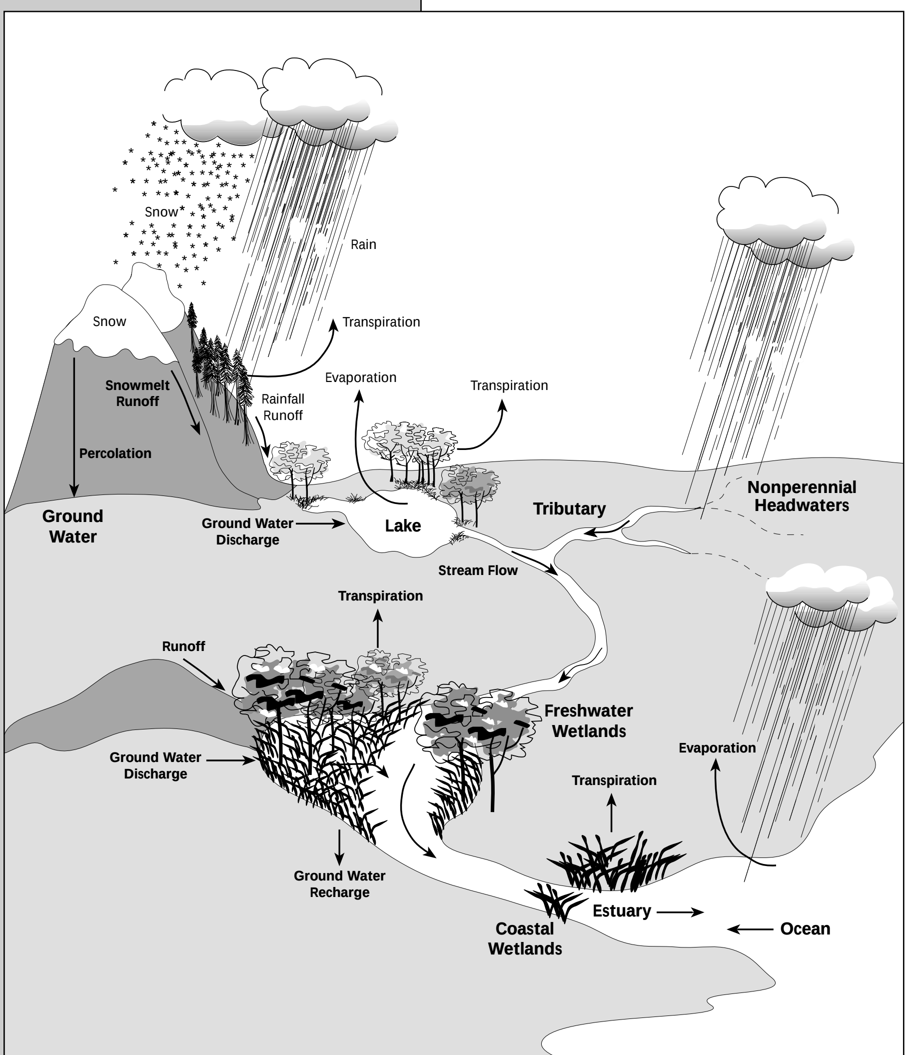
The Water Cycle

The water cycle describes how water moves through the environment and identifies the links between ground water, surface water, and the atmosphere (see figure). For convenience, discussions of the water cycle usually begin and end in the atmosphere. Water in the atmosphere condenses and falls onto the earth in the form of rain or snow. The rain or snow can contain contaminants from air pollution. The rain and snow may fall directly onto surface waters, be intercepted by plants or structures, or fall onto the ground. Intercepted water evaporates directly back into the atmosphere or drips onto the ground.



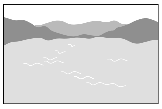
On the ground, rainfall and melting snow percolate deeper into the ground, saturating the soil and recharging ground water aquifers. Trees and other plants take up water in the upper soil zone through their roots and return the water to the atmosphere in a process called transpiration. Ground water below the root zone may migrate many miles and emerge (or discharge) into a distant surface water.

When rainfall or melting snow saturates soils, water runs off the ground into surface waterbodies (such as lakes, streams, wetlands, and coastal waters). Runoff may dislodge soil particles and pollutants and carry them into surface waterbodies. Surface waters may evaporate back into the atmosphere, percolate into the underlying ground water, or flow into other surface waters until reaching the ocean. From the ocean, water evaporates back into the atmosphere, completing the cycle.

period of time, usually due to dry conditions or upstream withdrawals. Many rivers and streams originate in nonperennial headwaters that flow only during snowmelt or heavy rains. Nonperennial streams provide critical habitats for nonfish species, such as amphibians and dragonflies, as well as safe havens for juvenile fish escaping predation by larger fish.

Nonperennial waters pose challenges to monitoring programs because their flow is unpredictable. Some intermittent waters' flow recurs predictably during particular times of the year, for example, following spring snowmelt. Ephemeral waters are almost impossible to monitor because their flow is so unpredictable. Most states focus monitoring activities in perennial waters, although many states monitor intermittent waters during periods of predictable flow.

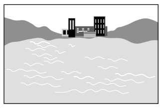
The health of rivers and streams is directly linked to the integrity of habitat along the river corridor and in adjacent wetlands. Stream quality will deteriorate if activities damage vegetation along river banks and in nearby wetlands. Trees, shrubs, and grasses filter pollutants from runoff and reduce soil erosion. Removal of vegetation also eliminates shade that moderates stream temperature. Stream temperature, in turn, affects the availability of dissolved oxygen in the water column for fish and other aquatic organisms.



Lakes, Reservoirs, and Ponds

Lakes, reservoirs, and ponds are depressions that hold water for extended periods of time. These waterbodies may receive water carrying pollutants from rivers and streams, melting snow, runoff, or ground water. Lakes may also receive pollution directly from the air.

Pollutants become trapped in lakes, reservoirs, and ponds because water exits these waterbodies at a slow rate. Therefore, they are especially vulnerable to additional inputs of pollutants from human activities. Even under natural conditions, sediment, nutrients, and organic materials accumulate in lakes and ponds as part of a natural aging process called eutrophication. Increased loads of nutrients from human activities such as wastewater discharges, septic systems, and agricultural runoff can overload lake systems and accelerate eutrophication. Algae blooms, depressed oxygen levels, and aquatic weeds are symptoms of accelerated eutrophication from excessive nutrients.



The Great Lakes

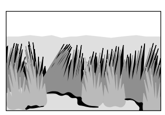
The Great Lakes—Superior, Michigan, Huron, Erie, and Ontario—are the largest system of fresh surface water on earth, by area. They contain approximately 18% of the world's fresh water supply. The Great Lakes basin is currently home to one-tenth of the population in the United States and one-quarter of the population of Canada.

Despite their large size, the Great Lakes are sensitive to the effects of a broad range of contaminants that enter the Lakes from polluted air, ground water, surface water, wastewater discharges,

Both the commercial fishing industry and recreational anglers rely on healthy estuaries to provide habitat for developing fish and shellfish.

and overland runoff. Even dilute quantities of toxic chemicals can have adverse effects on water quality because many toxic chemicals persist in the environment and concentrate in organisms, including fish.

Scientists estimate that atmospheric deposition contributes 35% to 50% of a variety of chemicals entering the Great Lakes each year. Atmospheric deposition occurs in two forms, wet or dry. In wet deposition, precipitation events (such as rain or snow) remove pollutants from the atmosphere. Dry deposition occurs when particles settle out of the air directly on a lake surface or within the extensive land basin draining into a lake. It is difficult to manage atmospheric sources of pollutants entering the Great Lakes because these pollutants may originate in the Great Lakes basin or hundreds of miles away.

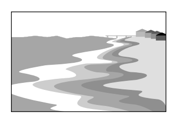


Estuaries

The fresh water of rivers mixes with the salty ocean water in estuaries. Estuarine waters include bays and the tidal portions of rivers. Estuaries serve as nursery areas for many commercial fish and most shellfish populations, including shrimp, oysters, crabs, and scallops. Most of our nation's fish and shellfish industry relies on productive estuarine waters and their adjacent wetlands to provide healthy habitat for some stage of fish and shellfish development. Recreational anglers also enjoy harvesting fish that reproduce or feed in estuaries, such as striped bass and flounder.

Pollutants from both local and distant sources tend to accumulate in estuaries. Most pollutants that enter rivers flow toward the coast. As rivers approach the coast, their mouths broaden and currents slow. The low flow and fluctuating tides, typical of estuarine waters, reduce flushing and trap nutrients and pollutants. This natural trapping process lays the foundation for rich estuarine ecosystems but also makes estuaries vulnerable to overloading of nutrients and pollutants.

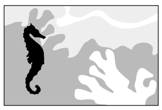
Historic development patterns have amplified this natural process in estuaries and along all our coasts. Historically, industrial development and population centers have clustered around estuarine bays that provided access to shipping and an adjacent waterbody for waste disposal. Now, many coastal cities must address historic contaminated sediments and develop alternative disposal systems for their outdated combined sewer systems.



Ocean Shoreline Waters

Our ocean shoreline waters provide critical habitat for various life stages of commercial fish and shellfish (such as shrimp), provide habitat for endangered species (such as sea turtles), and support popular recreational activities, including sport fishing and swimming.

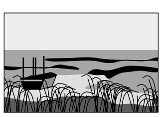
Despite their vast size and volume, oceans are vulnerable to impacts from pollutants, especially in nearshore waters that receive inputs from adjoining surface waters, ground water, wastewater discharges, and nonpoint source runoff. Beach closures due to elevated bacterial concentrations are one of the most visible symptoms of water quality degradation in ocean shoreline waters resulting from activities onshore. Wastes disposed of offshore may also impact nearshore waters. Oil spills from tankers or offshore extraction facilities can generate persistent adverse impacts on ocean shoreline waters.



Coral Reefs

Coral reefs are among the most productive ecosystems in the ocean. These living ecosystems are inhabited by a wide variety of fish, invertebrate, and plant species. They also provide important economic opportunities, primarily in terms of fishing and tourism. Coral reefs are found in three states—Hawaii, Florida, and Texas—and five U.S. territories—American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

Recent evidence indicates that coral reefs are deteriorating worldwide. To prevent further deterioration of coral ecosystems, President Clinton signed Executive Order 13089 on Coral Reef Protection. This order created the U.S. Coral Reef Task Force made up of representatives from the three states and five territories with coral resources. In response, these areas have initiated or increased efforts to identify the causes of coral reef degradation and approaches to prevent further loss.

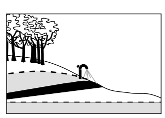


Wetlands

In general, wetlands are a transition zone between land and water where the soil is occasionally or permanently saturated with water. Wetlands are populated by plants that are specially adapted to grow in standing water or saturated soils. There are many different types of wetlands, including marshes, bogs, fens, swamps, mangroves, prairie potholes, and bottomland hardwood forests. Wetlands may not always appear to be wet. Many wetlands dry out for extended periods of time. Other wetlands may appear dry on the surface but may be saturated underneath.

Saltwater wetlands fringe estuaries; freshwater wetlands border rivers, lakes, and the Great Lakes or occur in isolation. In general, wetlands improve water quality, provide critical habitat for a wide variety of fish and wildlife, provide storage for flood waters, and stabilize shorelines. Wetlands filter sediment and nutrients (from both natural and nonnatural sources) out of the water before they enter adjacent waterbodies and underlying ground water aquifers. Wetlands also provide storage for floodwaters and reduce the velocity of overland runoff. Reduced velocity translates into less damage from flood waters.

Wetlands can be physically destroyed by filling, draining, and dewatering, or wetlands can be damaged by the same pollutants that degrade other waterbodies, such as toxic chemicals and oxygen-demanding substances.



Ground Water

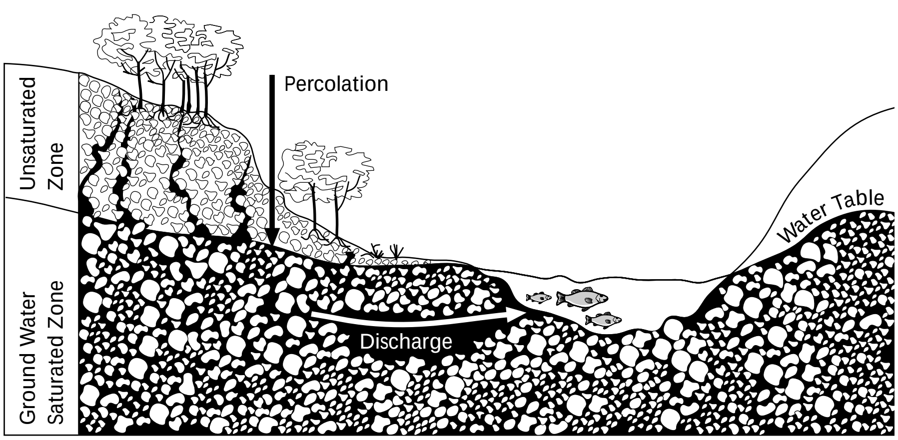
Beneath the land's surface, water resides in two general zones, the saturated zone and the unsaturated zone (Figure 1-1). The unsaturated zone lies directly beneath the land surface, where air and water fill in the pore spaces between soil and rock particles. Water saturates the pore spaces in the saturated zone beneath the unsaturated zone in most cases. The term "ground water" applies to water in the saturated zone. This water is an important natural resource and is used for myriad purposes, including drinking water, irrigation, and livestock uses.

Surface water replenishes (or recharges) ground water by percolating through the unsaturated zone. Therefore, the unsaturated zone plays an important role in ground water hydrology and may act as a pathway for ground water contamination.

Ground water can move laterally and emerge at discharge sites, such as springs on hillsides or seeps in the bottoms of streams, lakes, wetlands, and oceans. Therefore, ground water affects surface water quantity and quality because polluted ground water can contaminate surface waters. Conversely, some surface waters, such as wetlands, contain flood waters and replenish ground waters. Loss of wetlands reduces ground water recharge.

Figure 1-1

Ground Water



Water Quality Standards

In 1972, Congress adopted the Clean Water Act (CWA), which establishes a framework for achieving its national objective ". . . to restore and maintain the chemical, physical, and biological integrity of the nation's waters." Congress decreed that, where attainable, water quality ". . . provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water." These goals are referred to as the "fishable and swimmable" goals of the Act.

The Act required states, tribes, and other jurisdictions to develop water quality standards to guide the restoration and protection of all waters of the United States. EPA regulations require that, wherever attainable, they include, at a minimum, the fishable and swimmable goals of the Act. States must submit their standards to EPA for approval. Once approved, water quality standards are the benchmark against which monitoring data are compared to assess the health of waters under Section 305(b), to list impaired waters under Section 303(d), and to develop Total Maximum Daily Loads in impaired waters. They are also used to calculate water-quality-based discharge limits in permits issued under the National Pollutant Discharge Elimination System (NPDES).

Water quality standards have three elements: designated uses, criteria developed to protect each use, and an antidegradation policy.

■ State **designated uses** are the beneficial uses that water quality should support. Where attainable, all waters should support drinking water supply, recreation (such as swimming and surfing), aquatic life, and fish consumption. Additional important uses include agriculture, industry, and navigation. Waste transport or disposal is not an acceptable designated use. Each designated use has a unique set of water quality criteria that must be met for the use to be realized. States, tribes, and other jurisdictions may designate an individual waterbody for multiple uses.

■ State **water quality criteria** come in two forms, numeric criteria and narrative criteria.

Numeric criteria include aquatic life criteria, human health criteria, biological criteria, and sediment quality guidelines. They establish thresholds for the physical conditions, chemical concentrations, and biological attributes required to support a beneficial use.

Narrative criteria define, rather than quantify, conditions that must be maintained to support a designated use. For example, a narrative criterion might be "Waters must be free of substances that are toxic to humans, aquatic life, and wildlife."

Narrative biological criteria address the expected characteristics of aquatic communities within a waterbody. For example, "Ambient water quality shall be sufficient to support life stages of all indigenous aquatic species."

■ **Antidegradation policies** are intended to protect existing uses and prevent waterbodies from deteriorating even if their water quality is better than the fishable and swimmable goals of the Act.

Water Quality Assessment

Section 305(b) of the CWA requires that states evaluate the extent to which their state waters meet water quality standards and achieve the fishable and swimmable goals of the Act. This section calls for states to report the results to EPA every 2 years. The states,

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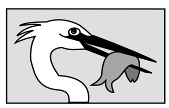
Water quality standards consist of

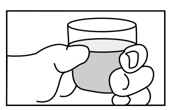
- *Designated beneficial uses*
- *Numeric and narrative criteria for biological, chemical, and physical parameters*
- *Antidegradation policy*

participating tribes, and other jurisdictions measure attainment of the CWA goals by determining how well their waters support their designated beneficial uses. They determine designated use support by comparing water quality data to the narrative and numeric criteria developed to ensure use support. States, tribes, and other jurisdictions assess waterbodies for support of the individual uses designated for a particular waterbody, which generally include the following individual uses:



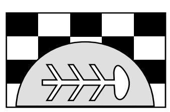
Aquatic Life Support

The waterbody provides suitable habitat for protection and propagation of desirable fish, shellfish, and other aquatic organisms.



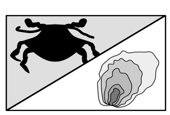
Drinking Water Supply

The waterbody can supply safe drinking water with conventional treatment.



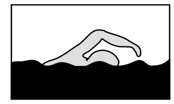
Fish Consumption

The waterbody supports fish free from contamination that could pose a human health risk to consumers.



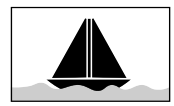
Shellfish Harvesting

The waterbody supports a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.



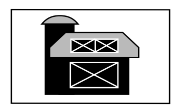
Primary Contact Recreation – Swimming

People can swim in the waterbody without risk of adverse human health effects (such as catching waterborne diseases from raw sewage contamination).



Secondary Contact Recreation

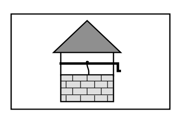
People can perform activities on the water (such as boating) without risk of adverse human health effects from ingestion or contact with the water.



Agriculture

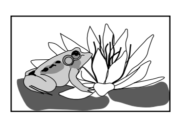
The water quality is suitable for irrigating fields or watering livestock.

States, tribes, and other jurisdictions may also define their own individual uses to address special concerns. For example, many tribes and states designate their waters for the following additional uses:



Ground Water Recharge

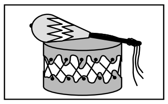
The surface waterbody plays a significant role in replenishing ground water, and surface water supply and quality are adequate to protect existing or potential uses of ground water.



Wildlife Habitat

Water quality supports the waterbody's role in providing habitat and resources for land-based wildlife as well as aquatic life.

Tribes may designate their waters for special cultural and ceremonial uses.



Culture

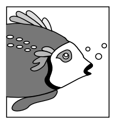
Water quality supports the waterbody's role in tribal culture and preserves the waterbody's religious, ceremonial, or subsistence significance.

States, tribes, and other jurisdictions determine the level of use support by comparing monitoring data with the narrative and numeric water quality criteria adopted to ensure support of each use designated for a particular waterbody. If monitoring data are not available, the state, tribe, or other jurisdiction may determine the level of use support with qualitative information. Valid qualitative information includes land use data, fish and game surveys, and predictive model results.

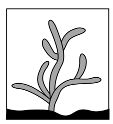
States identify the type of data, monitored or evaluated, that they used to make each use support determination. **Monitored assessments** are based on recent monitoring data collected during the past 5 years. These data include ambient water chemistry, biological assessments, fish tissue contaminant levels, and sediment chemistry. **Evaluated assessments** are based on qualitative information or monitored information more than 5 years old.

Summary of Use Support

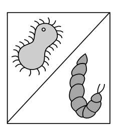
For waterbodies with more than one designated use, the states, tribes, and other jurisdictions consolidate the individual use support information into a summary use support determination:



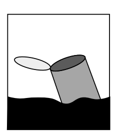
Good/Fully Supporting All Uses – Based on an assessment of available data, water quality supports all designated uses. Water quality meets narrative and/or numeric criteria adopted to protect and support a designated use.



Good/Threatened for One or More Uses – Although all the assessed uses are currently met, data show a declining trend in water quality. Projections based on this trend indicate water quality will be impaired in the future, unless action is taken to prevent further degradation.



Impaired for One or More Uses – Based on an assessment of available data, water quality does not support one or more designated uses.



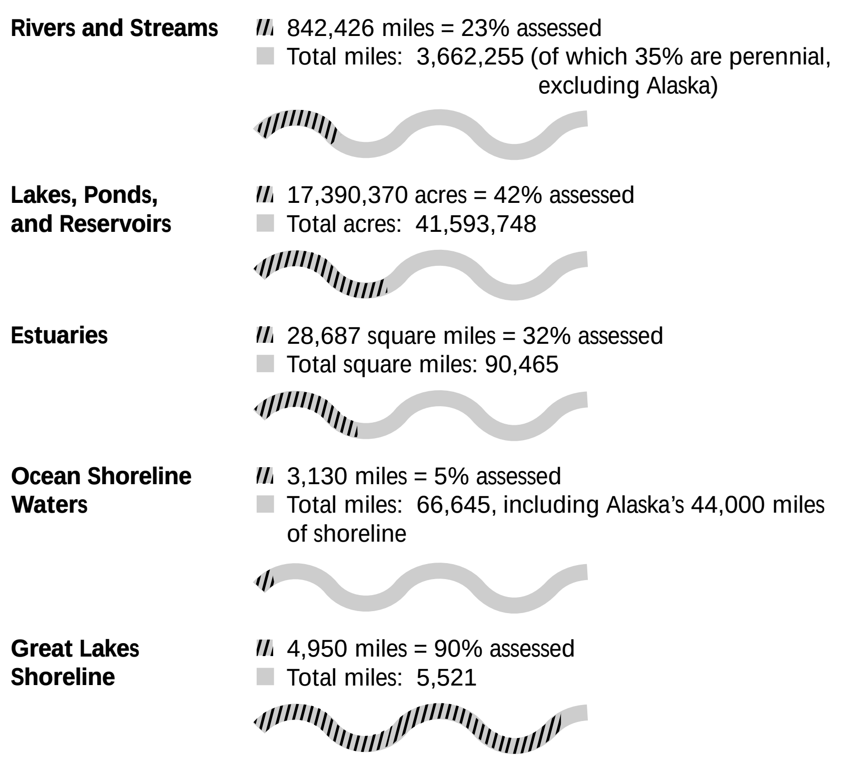
Use Not Attainable – The state, tribe, or other jurisdiction performed a use-attainability analysis and demonstrated that one or more designated uses are not attainable due to one of six conditions specified in the *Code of Federal*

Regulations (40 CFR 131.10). These conditions include

- Naturally high concentrations of pollutants
- Other natural physical features that create unsuitable aquatic life habitat (such as inadequate substrate, riffles, or pools)
- Low flows or water levels
- Dams and other hydrologic modifications that permanently alter waterbody characteristics
- Poor water quality resulting from human activities that cannot be reversed without causing further environmental degradation
- Poor water quality that cannot be improved without imposing more stringent controls than those required in the CWA that would result in widespread economic and social impacts.

Figure 1-2

Percentage of Waters Assessed for the 1998 Report



Source: 1998 Section 305(b) reports submitted by the states, tribes, territories, and commissions.

Waters Assessed for the 1998 Report

This report does not describe the health of all waters of the United States. Chapters 3 through 7 summarize the health of only the portion of waters that states reported on in their individual 1998 water quality inventories. Figure 1-2 compares the amount of waters assessed for the 1998 report to the total amount of waters in the United States.

Most states do not assess all of their waterbodies during the 2-year reporting cycle required under CWA Section 305(b). However, following the recommendations of the 305(b) Consistency Workgroup, many states are employing techniques to enable them to characterize all of their waters. The approach used by most states is a rotating basin approach. Some states are using statistically based sample designs.

Under the rotating basin approach, states achieve comprehensive monitoring of all waters over a set period of time (typically 5 years). In each year the state monitors a portion (typically one-fifth) of the watersheds within the state. This approach enables states to integrate their monitoring activities with other regulatory activities such as permit issuance.

A statistically based approach uses random sampling designed so that data collected at a relatively small number of sample locations can be extrapolated to characterize all waters of the state. An advantage of this approach is that it allows states to characterize statewide water quality each year. A random sample design also reduces the potential for bias in the selection of sample locations.

Some states' monitoring programs combine both of these approaches. They apply a random sampling design within each watershed under a rotating basin monitoring schedule. This allows them to both improve the statistical confidence of sampling results and integrate their monitoring program with other regulatory activities.

Because states employ different monitoring designs and because they have not achieved comprehensive assessment of water quality, the summary information in this report is not intended to predict the health of waters that have not been assessed. Rather this report presents a description of the waters that states have assessed. It identifies which of the assessed waters appear healthy and which are impaired. For those waters characterized as impaired, states provided information on the causes and sources of impairment.

Pollutants That Impair Water Quality and Their Sources

Where possible, states, tribes, and other jurisdictions identify the pollutants causing water quality impairments and the sources of those pollutants. Causes of impairment are pollutants or stressors that prevent water quality from meeting numeric or narrative criteria adopted by states to protect designated uses. Causes of impairment include chemical contaminants (such as PCBs, dioxins, and metals), physical parameters (such as temperature), and biological parameters (such as aquatic weeds). The leading causes of impairment reported by the

Karen Lauterbach, Bald Head Island, NC

states, tribes, and other jurisdictions in 1998 are described in the highlight beginning on page 18.

Sources of impairment generate the pollutants that cause water quality impairment (Table 1-1). Point sources discharge pollutants directly into surface waters from a conveyance. Point sources include industrial facilities, municipal sewage treatment plants, combined sewer overflows, and storm sewers. Nonpoint sources deliver pollutants to surface waters from diffuse origins. Nonpoint sources include urban runoff that is not captured in a storm sewer, agricultural runoff, leaking septic tanks, and deposition of contaminants in the atmosphere due to air pollution. Habitat alterations, such as hydromodification, dredging, and streambank destabilization, can also degrade water quality.

In Chapters 3 through 7, EPA tallies the significance of causes and sources of pollution by the percentage of assessed waters impaired by each individual cause or source (obtained from the Section 305(b) reports submitted by the states, tribes, and other jurisdictions). It is important to remember that this tally reflects the condition of the subset of waters that were assessed and identified as impaired. It does not address the condition of the waters that were not assessed.

Table 1-1. Pollution Source Categories Used in This Report

Category	Examples
Industrial	Pulp and paper mills, chemical manufacturers, steel plants, metal process and product manufacturers, textile manufacturers, food processing plants
Municipal	Publicly owned sewage treatment plants that may receive indirect discharges from industrial facilities or businesses
Combined Sewer Overflows	Single facilities that treat both storm water and sanitary sewage, which may become overloaded during storm events and discharge untreated wastes into surface waters
Storm Sewers/ Urban Runoff	Runoff from impervious surfaces including streets, parking lots, buildings, and other paved areas
Agricultural	Crop production, pastures, rangeland, feedlots, animal operations
Silvicultural	Forest management, tree harvesting, logging road construction
Construction	Land development, road construction
Resource Extraction	Mining, petroleum drilling, runoff from mine tailing sites
Land Disposal	Leachate or discharge from septic tanks, landfills, and hazardous waste sites
Hydrologic Modification	Channelization, dredging, dam construction, flow regulation
Habitat Modification	Removal of riparian vegetation, streambank modification, drainage/ filling of wetlands

In the West

In the West, water flows uphill
Leaping across the Tehachapi Mountains
To fill the mouth of the City of Angels.

In the West, the streams serve us
Captured and prisoned, in tunnels, in siphons and aqueducts
Bleeding into our irrigated lands.

In the West, once the rivers' voices
Coaxed the salmon, surging thick against the current
Lured the antelope and bison herds to their banks.
Now there is silence.

In the West, the rivers are the Disappeared
Their bones buried in a common grave
We forget their names
And call the land "Desolation"

River of Words 1998 Grand Prize Winner (Poetry, Grades 7-9)
Todd Detter, Grade 9, AZ

River of Words 1999 Grand Prize Winner (Art, Grades K-2)
Ella Katherine Darham, *Raging River*, MT

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Pollutants and Stressors That Impair Water Quality

This highlight describes individual pollutants and stressors separately. In reality, water quality usually suffers from the combined effects of several pollutants and processes. EPA encourages water quality managers and the public to use a holistic approach to managing our integrated water quality problems.

Oxygen-Depleting Substances

Dissolved oxygen is a basic requirement for a healthy aquatic ecosystem. Most fish and beneficial aquatic insects “breathe” oxygen dissolved in the water column. Some fish and aquatic organisms (such as carp and sludge worms) are adapted to low-oxygen conditions, but most desirable fish species (such as trout and salmon) suffer if dissolved oxygen concentrations fall below 3 to 4 mg/L (3 to 4 milligrams of oxygen dissolved in 1 liter of water, or 3 to 4 parts of oxygen per million parts of water). Larvae and juvenile fish are more sensitive and require even higher concentrations of dissolved oxygen, ranging from 5 to 8 mg/L.

Many fish and other aquatic organisms can recover from short periods of low dissolved oxygen availability. However, prolonged episodes of depressed dissolved oxygen concentrations of 2 mg/L or less can result in “dead” waterbodies. Prolonged exposure to low dissolved oxygen conditions can suffocate adult fish or reduce their reproductive survival by suffocating sensitive eggs and larvae or can starve fish by killing aquatic insect larvae and other prey. Low dissolved oxygen concentrations also favor anaerobic bacterial activity that produces noxious gases or foul odors often associated with polluted waterbodies.

Oxygen concentrations in the water column fluctuate under natural conditions, but severe oxygen depletion usually results from human activities that introduce large quantities of biodegradable organic materials into surface waters. Biodegradable organic materials contain plant, fish, or animal matter. Leaves, lawn clippings, sewage, manure, shellfish processing waste, milk solids, and other food processing wastes are types of biodegradable organic materials that enter our surface waters.

In both pristine and polluted waters, beneficial bacteria use oxygen to break apart (or decompose) organic materials. Pollution-containing organic wastes provide a continuous food supply for the bacteria, which accelerates bacterial activity and population growth. In polluted waters, bacterial consumption of oxygen can rapidly outpace oxygen replenishment from the atmosphere and photosynthesis performed by algae and aquatic plants. The result is a net decline in oxygen concentrations in the water.

Often, water quality managers measure the biochemical oxygen demand (or BOD) of pollution or natural organic materials in water. BOD is a measure of how much oxygen is consumed during the degradation of organic matter and the oxidation of some inorganic matter. Toxic pollutants can indirectly elevate BOD by killing algae, aquatic weeds, or fish, which provides an abundance of food for oxygen-consuming bacteria. Oxygen depletion can also result from chemical reactions that do not involve bacteria. Some pollutants trigger chemical reactions that place a chemical oxygen demand on receiving waters.

Other factors, such as temperature and salinity, influence the amount of oxygen dissolved in water. Prolonged hot weather will depress oxygen concentrations and may cause fish kills even in clean waters because warm water cannot hold as much oxygen as cold water. Warm conditions further aggravate oxygen depletion by stimulating bacterial activity and respiration in fish, which consumes oxygen. Removal of streamside vegetation eliminates shade, thereby raising water temperatures, and accelerates runoff of organic debris. Under such conditions, minor additions of pollution-containing organic materials can severely deplete oxygen.

Nutrients

Nutrients are essential building blocks for healthy aquatic communities, but excess nutrients (especially nitrogen and phosphorus compounds) overstimulate the growth of aquatic weeds and algae. Excessive growth of these organisms, in turn, can clog navigable waters, interfere with swimming and boating, outcompete native submerged aquatic vegetation (SAV), and, with excessive decomposition, lead to oxygen depletion. Oxygen concentrations can fluctuate daily during algae blooms, rising during the day as algae perform photosynthesis and falling at night as algae continue to respire, which consumes oxygen. Beneficial bacteria also consume oxygen as they decompose the abundant organic food supply in dying algae cells.

Lawn and crop fertilizers, sewage, manure, and detergents contain nitrogen and phosphorus, the nutrients most often responsible for water quality degradation. Rural areas are vulnerable to ground water contamination from nitrates (a compound containing nitrogen) found in fertilizer and manure. Very high concentrations of nitrate

(>10 mg/L) in drinking water cause methemoglobinemia, or blue baby syndrome, an inability to fix oxygen in the blood.

Nutrients are difficult to control because lake and estuarine ecosystems recycle nutrients. Rather than leaving the ecosystem, the nutrients cycle among the water column, algae and plant tissues, and the bottom sediments. For example, algae may temporarily remove all the nitrogen from the water column, but the nutrients will return to the water column when the algae die and are decomposed by bacteria. Therefore, gradual inputs of nutrients tend to accumulate over time rather than leave the system.

Sedimentation and Siltation

In a water quality context, sediment usually refers to soil particles that enter the water column from eroding land. Sediment consists of particles of all sizes, including fine clay particles, silt, sand, and gravel. Water quality managers use the term "siltation" to describe the suspension and deposition of small sediment particles in waterbodies.

Sedimentation and siltation can severely alter aquatic communities. Sedimentation may clog and abrade fish gills, suffocate eggs and aquatic insect larvae on the bottom, and fill in the pore space between bottom cobbles where fish lay eggs. Suspended silt and sediment interfere with recreational activities and aesthetic enjoyment at waterbodies by reducing water clarity and filling in waterbodies. Sediment may also carry other pollutants into waterbodies. Nutrients and toxic chemicals may attach to sediment particles on land and ride the particles into surface waters where the pollutants may settle with the sediment or detach and become soluble in the water column.

Rain washes silt and other soil particles off of plowed fields, construction sites, logging sites, urban areas, and strip-mined lands into waterbodies. Eroding streambanks also deposit silt and sediment in waterbodies. Removal of vegetation on shore can accelerate streambank erosion.

Bacteria and Pathogens

Some waterborne bacteria, viruses, and protozoa cause human illnesses that range from typhoid and dysentery to minor respiratory and skin diseases. These organisms may enter waters through a number of routes, including inadequately treated sewage, storm water drains, septic systems, runoff from livestock pens, and sewage dumped overboard from recreational boats. Because it is impossible to test waters for every possible disease-causing organism, states and other jurisdictions usually measure indicator bacteria that are found in great numbers in the stomachs and intestines of warm-blooded animals and people. The presence of indicator bacteria suggests that the waterbody may be contaminated with untreated sewage and that other, more dangerous, organisms may be present. The states, tribes, and other jurisdictions use bacterial criteria to determine if waters are safe for recreation and shellfish harvesting.

Toxic Organic Chemicals and Metals

Toxic organic chemicals are synthetic compounds that contain carbon, such as PCBs, dioxins, and DDT. These synthesized compounds often persist and accumulate in the environment because they do not readily break down in natural ecosystems. Many of these compounds cause cancer in people and birth defects in other predators near the top of the food chain, such as birds and fish.

Pesticides are chemicals applied to control or eliminate insect, fungal, or other organisms that may seriously reduce the yields of crops or impact the health of livestock. When pesticides run off the land and enter waterbodies, they may become toxic to aquatic life. Some newer pesticide agents decompose rapidly after application; however, many older types are more persistent. These longer-lived agents can pollute larger areas and many forms (e.g., DDT or chlordane) can build up in sediments or bioaccumulate in food chains, posing potential health risks to wildlife or humans.

"Total toxics" is a term used by a number of states to describe various combinations of toxic pollutants identified in waterbodies. These may include pesticides, toxic organic chemicals, metals, un-ionized ammonia, and chlorine. In some instances, laboratory tests with plankton, minnows, or other target species may show the presence of toxicity, but more work may be required to identify the specific toxicants. These impacts from unknown toxicity may also be summarized under the concept of total toxics.

Metals occur naturally in the environment, but human activities (such as industrial processes and mining) have altered the distribution of metals in the environment. In most reported cases of metals contamination, high concentrations of metals appear in fish tissues rather than the water column because the metals accumulate in greater concentrations in predators near the top of the food chain.

pH

Acidity, the concentration of hydrogen ions, drives many chemical reactions in living organisms. The standard measure of acidity is pH, and a pH value of 7 represents a neutral condition. A low pH value (less than 5) indicates acidic conditions; a high pH (greater than 9) indicates alkaline conditions. Many biological processes, such as reproduction, cannot function in acidic or alkaline waters. Acidic conditions also aggravate toxic contamination problems because sediments release toxicants in acidic waters. Common sources of acidity include mine drainage, runoff from mine tailings, and atmospheric deposition.

Habitat Modification/ Hydrologic Modification

Habitat modifications include activities in the landscape, on shore, and in waterbodies that alter the physical structure of aquatic ecosystems and have adverse impacts on aquatic life. Examples of habitat modifications to streams include

- Removal of streamside vegetation that stabilizes the shoreline and provides shade, which moderates in-stream temperatures
- Excavation of cobbles from a stream bed that provide nesting habitat for fish
- Burying streams
- Excessive development sprawl that alters the natural drainage patterns by increasing the intensity, magnitude, and energy of runoff waters.

Hydrologic modifications alter the flow of water. Examples of hydrologic modifications include channelization, dewatering, damming, and dredging.

Suspended Solids and Turbidity

Suspended solids are a measure of the weight of relatively insoluble materials in the ambient water. These materials enter the water column as soil particles from land surfaces or sand, silt, and clay from stream bank erosion or channel scour. Suspended solids can include both organic (detritus and biosolids) and inorganic (sand or finer colloids) constituents. Under low-flow conditions, excessively high suspended solids can become siltation problems as the materials settle out and impact the substrate on rivers or fill in reservoirs or the upper ends of estuaries.

Turbidity is an optical property of very small particles that scatter light and reduce clarity in waterbodies. Although algal blooms can make waters turbid, turbidity is usually related to the smaller inorganic components of the suspended solids burden, primarily the clay particles. In addition to creating aesthetically undesirable conditions, turbidity helps trap heat. This can become a problem in cold water trout streams where fish are adapted to a particular range of temperatures.

Noxious Aquatic Plants

Noxious aquatic plants refers to species of rapidly growing macrophytes (vascular plants as opposed to algae) that may lead to unwanted alterations in the ecological balances of lakes, rivers, or other waterbodies and that can also interfere with human recreational activities. In most cases, the nuisance plants are nonnative introductions such as the Eurasian milfoil or hydrilla.

Oil and Grease

Oil and grease can be documented quantitatively from chemical tests or from qualitative

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observations of surface films with distinctive oily sheens. Oil and grease problems are usually related to spills or other releases of petroleum products. The most dramatic cases are associated with accidents involving oil tankers (e.g., the Exxon *Valdez*) or major pipeline breaks. Minor oil and grease problems can result from wet weather runoff from highways or the improper disposal in storm drains of motor oil. Large amounts of oil can be toxic to fish and wildlife, but even persistent surface films may decrease reaeration rates and cause damage to the gills or other exposed surface membranes of fishes.

Salinity and Mineralization

Salinity and mineralization are measures of the concentrations of various salts or other minerals dissolved in water. In near-coastal areas, these dissolved materials will include appreciable levels of sodium, which is a natural component of seawater. In estuaries where the natural inputs of fresh water have been reduced from upstream dams or diversions, evaporation may increase the salinity levels to very high levels that can stress fish or shellfish. For inland areas, the concerns commonly focus on such chemicals as dissolved chlorides or sulfates that can lead to high levels of mineralization. Areas with underlying gypsum deposits will often show high levels of mineralization as reflected in tests for total dissolved solids. Some reservoirs and river systems in arid regions may experience increases in mineralization levels that may make the water hard to use for drinking water or even irrigation purposes.

River of Words 1999 Finalist, Lauren D. Beebe, *River of Peace*, Age 11, CA

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Comprehensive Assessments

EPA and the states established a goal of comprehensively characterizing all surface and ground waters of each state using a variety of techniques targeted to the condition of, and goals for, the waters. These techniques may include a combination of targeted monitoring and probability-based designs.

Currently, states report on only a fraction of their waters (see Figure 1-2, page 14). In the past, states focused their monitoring on waters with known problems. This puts healthy waters at risk of deteriorating without anyone knowing. The goal of comprehensive assessments is to be able to characterize all waters of the state in an unbiased manner.

Comprehensive assessment is an evaluation of resources that provides complete spatial coverage of the geographic area or resource being studied. It provides information on the assessment value (condition of the resource), spatial and temporal trends in resource condition, causes/stressors and sources of pollution, and locational information.

Different methods are used by the states to achieve comprehensive monitoring. The two primary monitoring designs employed to achieve comprehensive assessment are probability-based design and targeted design. These designs are implemented on a statewide basis or on selected watersheds under a rotating basin approach, or both.

Several states discussed the use of probability-based monitoring. This involves choosing monitoring sites using statistical techniques that allow the state to infer the results for a specific waterbody type across an entire river basin, an entire ecoregion, or the entire state.

■ Maryland used a probability-based design to assess the biological condition of headwater streams statewide.

■ Arizona developed a probability-based network of ground water wells in order to make statistically valid statements about water quality in each of its aquifers; these aquifers will be sampled on a rotating basis until the entire state is assessed.

■ The western states of EPA Regions 8, 9, and 10 are developing a probability-based sampling design to characterize water quality of all perennial rivers and streams of each state under the Environmental Monitoring and Assessment Project Western Pilot.

Many states are expanding their targeted monitoring designs to be more representative of water quality. Monitoring stations are representative of a stream waterbody for a distance upstream and downstream that has no significant influences that might tend to change water or habitat quality. Examples of such influences include point or nonpoint source inputs, change in land use, or a large tributary or diversion. The targeted monitoring design is commonly used in the rotating basin approach.

About half of the states have implemented, or are in the process of implementing, a rotating basin approach. Under this approach, states intensively monitor a different set of basins each year. Typically, each basin in the state is monitored intensively in 1 out of every 5 years. Thus, the total amount of water monitored over the 5-year period approaches 100%. South Carolina has increased the number of sites monitored over a 5-year period by more than 50% due to the state's conversion to a rotating basin approach.

However, since monitoring resources in most states are relatively static, EPA is encouraging states to incorporate probability-based monitoring into their rotating basin frameworks. This may be the most powerful way for a state to achieve the goal of comprehensive assessments without increasing their monitoring budget. Several states are already implementing this concept. Indiana samples water chemistry, fish and aquatic macroinvertebrates, and fish tissue and sediment contaminant levels at probability-based sites in selected basins each year. South Carolina has also implemented a statewide probability-based network. West Virginia is testing a probability-based design within a rotating basin schedule to provide assessment summaries for all streams as well as for a subpopulation of smaller headwater streams. See the highlight on West Virginia's progress in achieving comprehensive assessments in Chapter 3.

Data sharing and coordination is another tool for increasing the amount of waters assessed. Many states have successfully used citizen volunteer monitoring and anticipate increased emphasis on volunteers in the future. Several other states are redesigning their statewide water quality monitoring programs, sometimes in cooperation with the U.S. Geological Survey and other state and federal agencies. A number of states have formed monitoring councils. They provide a forum for local, state, federal, university, and volunteer organizations to coordinate monitoring activities. EPA encourages the states to incorporate the goal of comprehensive assessment of all waters into such monitoring initiatives.

Part I

Water Quality Assessments

River of Words 1998 Grand Prize Winner (Art, Grades K-2)
Alex Schneble, *The Night*, Grade 2, WA

John H. McShane, Yellowstone River, Yellowstone National Park (Hayden Valley)

Monitoring and Assessment

Introduction

Water quality monitoring is essential for an understanding of the condition of water resources and to provide a basis for effective policies that promote wise use and management of those resources. One of the goals of the Clean Water Act is "to restore and maintain the chemical, physical, and biological integrity of the nation's waters." Monitoring activities are aimed at measuring progress toward achieving this goal.

States and other jurisdictions use monitoring information to assess the quality of water resources. These assessments characterize waters that support water quality standards, identify impaired waters, and describe potential causes and sources of impaired waters.

In 1997, EPA and the states set a goal to characterize all surface and ground waters in the United States. They developed a strategy to achieve comprehensive assessments within 5 years. This strategy embraces a variety of monitoring approaches to reflect the diversity among state monitoring programs. Most states focused on rivers and streams initially through a rotating basin approach. Many are expanding their efforts to include other waterbody types.

Monitoring our nation's waters is a big job. There are over 3.6 million miles of rivers and streams; 41.4 million acres of lakes, reservoirs, and ponds; 90,500 square miles of estuarine waters; 67,000 miles of coastal shoreline; and 5,500 miles of Great Lakes shoreline. To reach their goal of comprehensive assessments, states are looking beyond their own monitoring programs to identify opportunities to partner with other organizations collecting water quality data.

This chapter describes monitoring activities of local, state, federal, and volunteer organizations and efforts to share data in order to expand our knowledge of water quality in the United States. It also explains the process by which states use monitoring results to assess the quality of water resources.

Water Quality Monitoring – Who Collects the Data

Hundreds of organizations across the country conduct some type of water quality monitoring. States use much of these data, although not all of it, when reporting on water quality under Section 305(b) of the Clean Water Act. This section of the Act asks states to report on whether waters in the state are impaired or are supporting water quality standards. This includes the designated uses assigned to each waterbody and

Monitoring data are needed to

- Identify healthy and threatened waters that require protection
- Locate impaired waters for restoration
- Inform the public of use restrictions and cautions

One of the goals of the Clean Water Act is "to restore and maintain the chemical, physical, and biological integrity of the nation's waters." Monitoring activities are aimed at measuring progress toward achieving this goal.

the narrative and numeric water quality criteria adopted to protect the designated uses. States need specific monitoring data that they can use to evaluate whether the criteria are met and the uses supported.

Organizations conducting water resource monitoring include government agencies at all levels—federal, state, interstate, local, and tribal. They also include research organizations such as schools, universities, and foundations, as well as industries and volunteer organizations. Because there is so much data being collected by so many organizations, states face an enormous task of trying to assemble relevant data. Many states form monitoring councils to help coordinate monitoring efforts across organizations.

Monitoring Councils

Several states are forming monitoring councils to better utilize resources and maximize the quality and quantity of water resource monitoring data. A monitoring council brings together a network of stakeholders conducting monitoring for the purpose of collaborating, communicating, and exchanging information. A monitoring council provides a forum identifying environmental measures and the sampling and analytical methods most appropriate for answering local questions about local waters. Councils provide an opportunity to enhance mechanisms for data sharing and to test state-of-the-art tools such as geographic information system (GIS)-based mapping techniques. Many states are using monitoring councils to develop a Comprehensive State Monitoring Strategy.

The National Water Quality Monitoring Council was formed in October 1997 following the recommendations of the Intergovernmental Task Force on Monitoring Water Quality. Members include industry, academia, municipalities, agriculture, and volunteer monitoring groups. Current priorities of the Council include establishing the basis for rational monitoring programs, identifying comparable monitoring methods, expanding the use of comparable methods through multi-institutional collaborations, and improving access to monitoring data. For more information, visit the Council on the Internet at *http://water.usgs.gov/wicp/itfm.html*.

State and Tribal Agencies

Every state and territory collects data to characterize water quality. A growing number of tribes also monitor their water resources. States and tribes receive pollution control and environmental management grants from EPA that help them establish and maintain monitoring programs. These programs monitor a variety of water resource conditions including physical and chemical parameters, biological indicators, and habitat.

Often with limited resources, state and tribal monitoring programs support a number of objectives. In addition to assessment of whether waters are safe for drinking, swimming, fishing, and other beneficial uses, state and tribal monitoring is an integral part of water management and regulatory programs.

States and tribes use monitoring data to review and revise existing water quality standards and to develop new standards. Many states are monitoring biological conditions in pristine waters to help develop standards that protect biological integrity. Recent efforts by a number of states have been aimed at developing standards for estuaries, beaches, and wetlands.

Monitoring data on biological integrity, physical conditions, and chemical concentrations are used to identify threatened and impaired waters for 303(d) lists. States use chemical concentrations and waterbody flow data to develop pollutant-specific total maximum daily loads. These are designed to achieve water quality standards in impaired waters.

To reduce current loads to the level specified in the TMDL, states use monitoring data to allocate the load reduction goals, called wasteload allocations for point source discharges and load allocations for nonpoint sources. Then states and tribes use monitoring data to determine the effectiveness of the source controls and to measure progress toward achieving the water quality standards.

States and tribes also conduct monitoring in response to citizen complaints or catastrophic events such as fish kills, chemical spills, and red tides.

Local Governments

Across the country, a number of local government agencies, such as city and county environmental offices, conduct water quality monitoring. Local governments that operate water and wastewater treatment plants monitor water quality. Drinking water facilities monitor both raw or intake water and the finished water that is distributed to customers. Wastewater treatment plants (called publicly owned treatment works) monitor the quality of their wastewater discharge and sometimes the quality of water entering the treatment works. Larger municipalities also monitor stormwater discharges, and older municipalities with combined sanitary and stormwater sewers also monitor overflow discharges.

Volunteer Monitoring

Volunteer monitors—private citizens who volunteer to regularly collect and analyze water samples, conduct visual assessments of physical conditions, and measure the biological health of waters—are a rapidly growing contingent providing increasingly important environmental information. Volunteers are analyzing water samples for dissolved oxygen, nutrients, pH, temperature, and a host of other water constituents; evaluating the health of stream habitats and aquatic biological communities; inventorying stream-side conditions and land uses that may affect water quality; cataloging and collecting beach debris; and restoring degraded habitats. Volunteer data are used to delineate and characterize watersheds, screen for water quality problems, and measure baseline conditions and trends, among other things.

For more information on volunteer monitoring, including a directory of organizations, visit the Internet site *http://www.epa.gov/owow/monitoring*.

Research Organizations and Other Private Entities

Private groups such as universities, watershed associations, environmental groups, and industries also conduct water quality monitoring. They may collect water quality data for their own purposes or to share with government decision-makers. Industrial and municipal dischargers may also conduct monitoring as part of their discharge permits.

This wealth of information from individual agencies cannot be easily aggregated to provide an overview of national water quality conditions because of inconsistencies in monitoring purpose and design as well as data collection methods and assessment procedures. In addition, data are often stored without accompanying descriptors, so other data users cannot determine whether the data are useful for their own purposes.

Federal Participants

A study undertaken by the Intergovernmental Task Force on Monitoring Water Quality found that 18 federal agencies conduct approximately 141 separate monitoring programs across the country. Most water quality monitoring supports specific programs or activities. The following five conduct either regional or national programs for water quality monitoring.

U.S. Environmental Protection Agency

■ **Environmental Monitoring and Assessment Program (EMAP)** – EMAP is a research program designed to develop the tools necessary to monitor and assess the status and trends of national ecological resources. EMAP's goal is to develop the scientific understanding for translating environmental monitoring data from multiple spatial and temporal scales into assessments of ecological condition and forecasts of the future risks to the sustainability of our natural resources.

EMAP is embarking on a 5-year project in the western United States known as the EMAP Western Pilot Study. Its primary goals are to assess the condition of the ecological resources of the West and to advance the science of ecosystem health monitoring. The study will generate state and regional scale assessments of the condition of ecological resources in the western United States through monitoring of coastal waters and rivers and streams. Using monitoring results and remote sensing, the study will identify stressors associated with the degradation of these resources.

The Western Pilot Study will assess environmental conditions in Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. It is a partnership between EPA's Office of Research and Development; EPA's Office of Water; EPA Regions 8, 9, and 10; the states and tribes in those regions; and additional federal partners such as the U.S. Geological Survey and the National Oceanic and Atmospheric Administration (NOAA). Responsibilities for monitoring and assessment will be shared by these groups. All monitoring data will be housed in STORET (see the highlight on STORET and other information management tools on page 42).

- **National Study of Chemical Residues in Fish** – In 1998, EPA and NOAA initiated a study to estimate the national distribution of the mean levels of selected persistent bioaccumulative toxic chemical residues in fish and shellfish tissue in U.S. waters. Both the shellfish and fish studies will continue through 2002 and are being coordinated with state and tribal efforts as part of President Clinton's Clean Water Action Plan. The shellfish survey is based on data obtained by NOAA's ongoing Mussel Watch Project. The focus of the survey is on mercury concentrations in bivalve mollusks.

  The National Fish Survey is using a probability-based monitoring design to sample fish tissue in lakes and reservoirs. For these waterbodies, the survey will identify the chemicals found in the fish and characterize the levels of contamination in agricultural and nonagricultural areas of the United States.

- **Nonpoint Source National Monitoring Program** – EPA developed the Section 319 National Monitoring Program to improve our understanding of nonpoint source (NPS) pollution and to rigorously evaluate the effectiveness of NPS pollution control activities. Under this program, EPA's Regional Offices nominate projects by forwarding state proposals to EPA Headquarters for review and concurrence. Projects are selected on a competitive basis from within each of the EPA Regions. EPA works with project sponsors to develop approvable 6- to 10-year projects. The project sponsors then work through the state/EPA Section 319 process to obtain approval and funding. As of September 1997, 20 projects had been approved.

U.S. Geological Survey

- The National Water Quality Assessment (NAWQA) Program is designed to describe the status and trends in the quality of our nation's water resources and to provide a sound understanding of the natural and human factors that affect the quality of these resources. Investigations are being conducted in 59 areas called "study units." These investigations throughout the nation will provide a framework for national and regional water quality assessment. Regional and national synthesis of information from study units will consist of comparative studies of specific water quality issues using nationally consistent information.

- Since 1995, the National Stream Quality Accounting Network (NASQAN) has focused on monitoring water quality in four of the nation's largest river systems—the Mississippi (including the Missouri and Ohio), the Columbia, the Colorado, and the Rio Grande. NASQAN operates a network of 40 stations where the concentration of a broad range of chemicals—including pesticides and trace elements—and stream discharge are measured. Prior to 1995, NASQAN monitored water quality at as many as 500 stations nationwide.

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Region 7's Monitoring Strategy

In an effort to more comprehensively and confidently characterize the region's water resources, EPA Region 7 and the states in that Region (Iowa, Kansas, Missouri, and Nebraska) have embarked on a new joint monitoring strategy. The strategy seeks to create state monitoring partnerships. These monitoring partnerships are established to capitalize on scarce monitoring resources and to coordinate monitoring efforts among all the partners.

The New Monitoring Paradigm

The goals of Region 7's new monitoring strategy include increasing the percentage of waters assessed in the region, using indicators of biological integrity to describe aquatic communities, obtaining statistically comprehensive coverage of all waterbody types, and improving confidence in overall monitoring results. Steps EPA Region 7 has taken to date include

- **Forming an EPA water monitoring team** – Region 7 provided the internal organization (program managers, state coordinators, and technical monitoring experts) to help define the problem, develop a vision of how to solve the problem, and derive a process to achieve the solution.

- **Working to build partnerships** – Region 7 and the states worked hard to establish monitoring partnerships within each state. The Region provides support to the partnerships through sharing of technical expertise, providing analytical services, and through direct funding of monitoring programs such as R-EMAP.

- **Creating a monitoring and assessment framework** – As shown in the figure, the State/Regional Assessment Framework draws on information from a number of different sources. The goal of the framework is to create a powerful, scientifically defensible assessment of a state's water resources.

- **Using R-EMAP to help build the framework** – R-EMAP is a partnership among states, EPA's Environmental Monitoring and Assessment Program (EMAP), EPA's Regional offices, and other federal agencies. R-EMAP produces ecological assessments at regional, state, and local scales.

- **Conducting workshops** – Region 7 sponsors workshops for states on topics varying from monitoring design to data analysis techniques to developing biocriteria and even biological taxonomy.

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These efforts all focus on improving long-term baseline monitoring and building the working relationships needed to do so.

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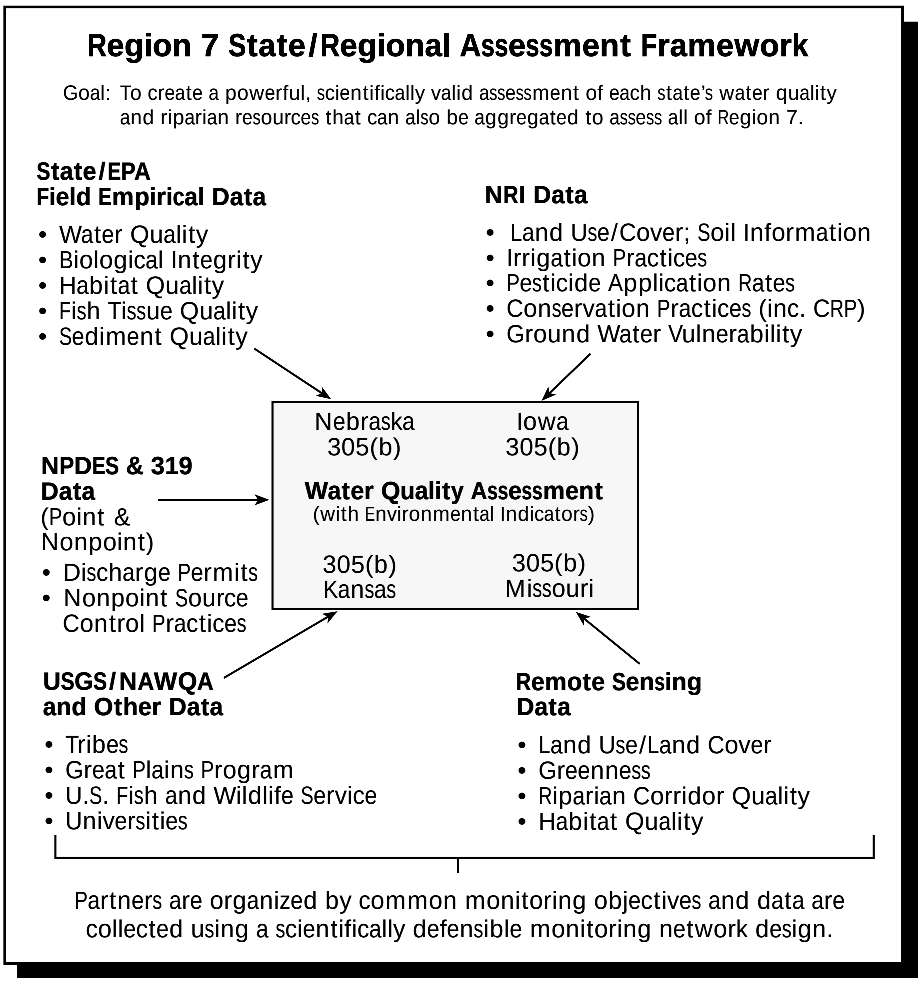

■ The USGS is the lead agency in monitoring atmospheric deposition in the United States. The National Atmospheric Deposition Program/ National Trends Network (NADP/ NTN) is designed to determine variations in atmospheric deposition that occur on a weekly basis and to collect wet and dry deposition products for analysis of elements and compounds that can contribute to the chemical composition of surface waters.

U.S. Fish and Wildlife Service

■ The National Wetlands Inventory (NWI) was established to generate information about the characteristics, extent, and status of the nation's wetlands and deepwater habitats. The NWI has mapped 89% of the lower 48 states and 31% of Alaska. About 39% of the lower 48 states and 11% of Alaska are digitized. Congressional mandates require the NWI to produce status and trends reports to Congress at 10-year intervals. In 1982, the NWI produced the first comprehensive, statistically valid estimate of the status of the nation's wetlands and wetland losses and in 1990 produced the first update. Future national updates are scheduled for 2000, 2010, and 2020.

National Oceanic and Atmospheric Administration

■ NOAA monitors the nation's coastal and estuarine environments to assess their condition and whether their condition is being affected by human activities. Traditionally, monitoring involved efforts to inventory the characteristics of coastal and estuarine areas, their resources, and the human pressures that threaten them. More recently, the role of monitoring has been expanded to include an examination of the complex cause-and-effect relationships that have developed through human-induced pressures on coastal areas, such as the effects of metals, pesticides, and nutrients on fish abundance, reproductive success, and ability to feed.

Tennessee Valley Authority (TVA)

■ Water quality and aquatic life monitoring is conducted by TVA in the Tennessee River system to identify pollution problems in specific watersheds. TVA's program includes measurement of physical, chemical, and biological parameters at strategic locations. In 1994, TVA launched the Clean Water Initiative to make the Tennessee River system the cleanest and most productive commercial river system in the United States. TVA's approach is receiving widespread acclaim and helping shape national water policy.

Type of Data Collected

State water quality assessments are normally based on five broad types of monitoring data, in keeping with the goals of the CWA: biological integrity, chemical, physical, habitat, and toxicity. Each type of data provides useful information about the quality of water resources. Together these data help managers identify and address water quality problems.

Biological Integrity Data

Biological integrity data represent an objective measurement of aquatic biological communities, including aquatic insects, fish, or algae. These data are used to evaluate the condition of an aquatic ecosystem with respect to the presence of human perturbation.

Most states use biological integrity data to interpret narrative criteria or qualitative descriptions in their water quality standards of aquatic life use support goals. A few states have adopted numeric biological criteria into their water quality standards.

Over the past few years, EPA has distributed guidance on developing numeric biological criteria for rivers and streams and, in 1999, for lakes. This guidance supplements previous guidance on conducting biological assessments. It describes the process of combining individual measures or metrics of biological health into a single value or index. The metrics fall within four categories of characteristics of biological health:

- Species composition
- Species richness
- Community structure and function
- Individual organism health.

Eight to twelve of the metrics are selected for inclusion in the index. They are selected based on their ability to predict associations between environmental quality and biological integrity.

Numeric biological criteria are developed using least impaired or pristine waters as the reference condition. The metrics are measured and the index calculated for the reference condition. The resulting numeric biological criteria define the threshold of biological integrity that is desired for all waters in the same designated use category. Numeric biological criteria are adopted as part of the state's water quality standards.

When a state with numeric biological criteria conducts a biological assessment of a waterbody, it collects data on each of the metrics, calculates the index score, and compares the score to the criterion. The index score provides an overall measure of biological integrity. States also examine the individual metrics because each one provides information on biological health and can be an early sign of change.

Chemical Data

All state water quality standards include numeric criteria for chemical pollutants. These pollutants include metals such as lead and mercury, organic chemicals such as pesticides and PCBs, nutrients such as nitrogen and phosphorous, and bacteria such as *Escherichia coli*. Numeric criteria exist for over 150 pollutants.

The criteria establish thresholds for pollutant concentrations in ambient waters and protect specific uses. For example, there are criteria that protect aquatic organisms from acute and chronic effects of exposure to specific chemicals. Another set of criteria establish thresholds for human health. These criteria protect humans from exposure

Biological integrity is the condition of a waterbody displayed as "a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of the natural habitat of the region."

Karr, J.R., and D. R. Dudley. 1981. Ecological perspective on water quality goals. *Environ. Manage.* 5:55-68.

through drinking, swimming, and consuming fish and shellfish.

States compare ambient monitoring data to chemical criteria when assessing whether water quality supports water quality standards. Monitoring for specific chemicals in waterbodies helps states identify the specific pollutants causing impairment. It also helps states trace the source of impairment.

Physical Attribute Data

Physical data include characteristics such as temperature, flow, dissolved oxygen, suspended solids, turbidity, conductivity, and pH. Most states have adopted numeric criteria in their water quality standards defining acceptable levels or ranges for specific physical attributes.

Physical attributes are useful screening indicators of potential problems. Many of them work together with chemical pollutants to mediate or exaggerate the toxic effects of chemicals. For example, metals become more bioavailable in low pH or acidic waters. This makes metals more likely to harm fish.

Habitat Data

The purpose of habitat monitoring is to provide information about the ability of a waterbody to support various forms of aquatic life. Habitat assessment typically supplements other types of water quality monitoring. The quality and quantity of available habitat affect the structure and function of biological communities.

Habitat assessments generally include a description of the site and surrounding land use, description of the waterbody origin and type, summary of the riparian vegetation along the shoreline and the aquatic vegetation, and measurement of parameters such as width, depth, flow, and substrate. The combination of habitat assessments, biological assessments, and chemical and physical data provides insight into the presence of chemical and nonchemical stressors to the aquatic ecosystem.

Toxicity Data

Toxicity testing is used to determine whether aquatic life beneficial use is being attained. Toxicity data are generated by exposing selected organisms such as fathead minnows, daphnia, or algae to known dilutions of wastewater discharge or ambient water samples. These tests are called bioassays. They are conducted to document the presence of a toxicity effect at either an acute or chronic concentration.

Acute effects will lead to excessive mortality rates over the span of a few hours to a few days. Such severe levels of toxicity can often be easily compared to chemical analyses for metals or organic toxins to confirm which pollutants are of concern.

Chronic toxicity involves exposing the most sensitive life stages of an organism. These tests assess effects of longer-term exposure. Chronic bioassay tests are especially helpful to document cases where one or more pollutants are present at fairly low concentrations.

When performed using a sample from a discharge, bioassays are called Whole Effluent Toxicity (WET) tests and are often included as a routine monitoring requirement in many industrial or municipal point source discharges. Bioassays can be useful for ambient waters where nonpoint source factors are suspected. Bioassays geared to ambient stream conditions can help to determine whether poor biological integrity is related to toxins, poor habitat, or a combination of the two.

Data and Information Management

A number of data and information management systems handle the enormous amount of water quality data generated by EPA and the states. Many of the data systems can be accessed via the Internet. Several data management systems are described below.

■ **STORET** – The STORET (STOrage and RETrieval) database is a repository for water quality and biological monitoring data and is used by state environmental agencies, EPA staff, federal agencies, and many others. The original STORET began operating in the 1960s. A modernized, more user-friendly version replaced it in 1998. This modern system runs on personal computers and includes a feature for data sharing. EPA encourages users to transmit their data over the Internet to the STORET warehouse. This key feature helps environmental managers gather and analyze all relevant and available data when evaluating the condition of water resources. Data can be downloaded from the Internet at *http://www.epa.gov/storet*. For more information on STORET, see the highlight on New Information Management Tools (page 42).

■ **Ecological Data Application System** – The Ecological Data Application System (EDAS) is designed to facilitate data analysis, particularly the calculation of biological metrics and indices. It is intended to take biological data from STORET and help states perform assessments. EDAS is a custom-designed relational database application for use with Microsoft Access 97.

■ **Assessment Database** – The Assessment Database (ADB) is a data management tool being used by states to record surface water quality assessment results and generate reports for use in preparing 305(b) reports. The ADB is a complete replacement for the EPA Waterbody System (WBS). The ADB was designed based on requests and feedback from WBS users. Like its predecessor, the ADB contains information that program managers can access quickly on the water quality status of a particular waterbody. Data elements include waterbody identification, location, designated use support status, causes of impairment, and sources of impairment. For more information on the Assessment Database, see the highlight on New Information Management Tools (page 42). In the future the ADB will be linked to STORET.

■ **Permit Compliance System** – Information on water discharge permits is contained in the Permit Compliance System (PCS), a national computerized management information system. This system automates the entry, update, and retrieval of National Pollutant Discharge Elimination System (NPDES) data and tracks permit issuance, permit limits and monitoring data, and other data pertaining to facilities regulated under NPDES. PCS records water discharge permit data on more than 75,000 facilities nationwide. For more information, visit the PCS web site at *http://www.epa.gov/envirofw/html/pcs/pcs_overview.html*.

■ **Safe Drinking Water Information System** – The Safe Drinking Water Information System (SDWIS) is used by EPA to store basic information about the nation's drinking water supply. SDWIS/FED is the national version of the database, used by EPA to track violations of drinking water requirements. SDWIS/STATE is an optional version states can use to store three major categories of information: inventory, sampling, and monitoring. Inventory data include information on individual water systems such as the system location, size, and population served. Sampling data include laboratory results for chemical, microbiological, and radiological contaminants regulated by EPA and the state. Monitoring information contains the schedule for sampling required under each EPA rule. Additional information on SDWIS/FED is available on the Internet at *http://www.epa.gov/safewater/sdwisfed/sdwis.htm*.

■ **National Listing of Fish and Wildlife Advisories** – The Office of Science and Technology developed a database for states to report fish advisory information and fish tissue contaminant data that support advisory determinations. The National Listing of Fish and Wildlife Advisories (NLFWA) contains fish and wildlife advisory information reported nationwide by states, including the waterbody affected, type of species, type of pollutants, type of advisory, geographic extent of the advisory, and name of a state contact person. In addition, the database contains information on contaminants in fish tissue. The database is available on the Internet at *http://www.epa.gov/ost/fish*.

■ **The Toxics Release Inventory** – The Toxics Release Inventory (TRI) stores data about toxic chemicals used, manufactured, treated, transported, or released into the environment. The Emergency Planning and Community Right-To-Know Act and the Pollution Prevention Act established reporting requirements for manufacturing and other facilities that meet certain conditions about the volume of toxic materials they use or manufacture. Additional information on the TRI is available on the Internet at *http:/www.epa.gov/opptintr/tri/*.

Using Data To Describe Water Quality

Currently, to assess the quality of their waters, states and tribes compare monitoring results to water quality standards. As described in Chapter 1, water quality standards consist of designated uses and specific criteria designed to protect each use.

Data collected by state, local, tribal, and federal agencies and public, academic, and private partners are needed to build the assessments used to make better water resource management decisions.

Without data, we simply cannot know where water quality problems exist, where we need to focus our efforts, or where progress has been made.

Assessments performed as part of the 305(b) process provide important information for making decisions about water resources. For example, assessments can be used to identify threatened and impaired waters for 303(d) listings and development of total maximum daily loads, establish point source discharge limits, determine restoration priorities for Unified Watershed Assessments, develop nonpoint source management measures, and protect drinking water sources.

EPA works closely with its local, state, and federal partners to improve the quality and increase the amount of the data used to support water quality assessments. EPA recognizes the most effective way to achieve these goals is to look for opportunities to integrate the monitoring efforts of its diverse partners. One such opportunity promoted by EPA is an integrated assessment and reporting process.

EPA envisions that the same monitoring data and decision criteria used to assess water quality for state 305(b) water quality inventories may also support the identification of impaired waters for state 303(d) lists. This information, together with geographic mapping tools, land use information, and data on terrestrial ecosystem quality, forms the basis for states identifying priority watersheds and developing watershed restoration strategies (which are part of the Unified Watershed Assessments under the Clean Water Action Plan).

As these data layers become available, they will be put on the Internet as part of the Index of Watershed Indicators. The IWI is continuing to evolve to include more detailed georeferenced data. The data used to generate the maps will be accessible through the Internet from a number of sources (e.g., STORET). These data display tools will allow the public greater access to water information locally, and they will provide better, more useful access for Congress to evaluate water information on local, regional, and national scales.

Ultimately, we will be able to observe trends in water quality both nationally and at the watershed level. This will provide Congress and citizens with the information needed to assess EPA's progress toward its goals under the Government Performance for Results Act.

River of Words 1999 Finalist, Amanda Morris, *Untitled*, Age 7, VA

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New Information Management Tools

EPA is offering several new information management tools to help states take advantage of new data technologies. These tools help states obtain and integrate data for analysis of water quality trends. The Assessment Database, STORET, Index of Watershed Indicators, Reach Indexing Tool, and the Watershed Information Network are all examples of new tools made available to states by EPA to help them obtain and manage data.

The Assessment Database

The Assessment Database (ADB) is a relational database application for tracking water quality assessment data. All states assess their individual waterbodies for degree of designated use support (e.g., "fully supporting aquatic life; not supporting primary contact recreation"). If a waterbody's uses are impaired, the stressors and sources of impairment are also determined (e.g., "causes/stressors are nutrients and sediment; sources are urban runoff and row crop agriculture"). States need to track this information and many other types of assessment data for thousands of waterbodies and integrate it into meaningful reports. The ADB is designed to make this process accurate, straightforward, and user-friendly for participating states, territories, tribes, and basin commissions.

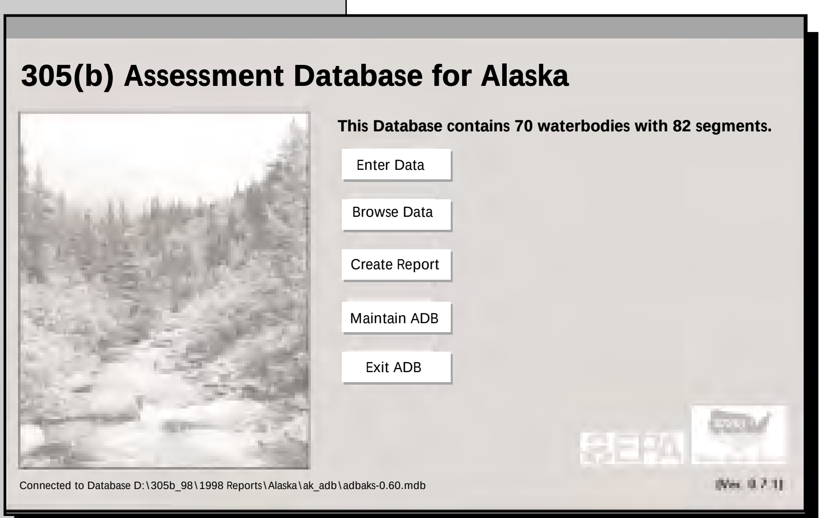
The ADB supports three principal functions:

- Improve the quality and consistency of water quality reporting

- Reduce the burden of preparing reports under Sections 305(b), 303(d), 314, and 319 of the Clean Water Act

- Improve water quality data analysis.

The ADB provides user-friendly data entry forms and automates the production of reports that states



submit to EPA through the 305(b) process.

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STORET (data STOrage and RETrieval system)

EPA maintains two data management systems containing water quality information for the nation's waters: the Legacy Data Center (LDC) and the data STOrage and RETrieval system (STORET). The LDC contains historical water quality data dating back to the early part of the 20th century and collected up to the end of 1998. STORET contains data collected beginning in 1999 and older data that have been properly documented and migrated from the LDC.

Both systems contain raw biological, chemical, and physical data on surface and ground water collected by federal, state, and local agencies; tribes; volunteer groups; academics; and others. All 50 states, the District of Columbia, territories, and jurisdictions of the United States, along with portions of Canada and Mexico, are represented in these systems.

Each sampling result in the LDC and in STORET is accompanied by information on where the sample was taken (latitude, longitude, state, county, Hydrologic Unit Code, and a brief site identification); when the sample was gathered; the medium sampled (e.g., water, sediment, fish tissue); and the name of the organization that sponsored the monitoring. In addition, STORET contains information on why the data were gathered; sampling and analytical methods used; the laboratory used to analyze the samples; the quality control checks used when sampling, handling the samples, and analyzing the data; and the personnel responsible for the data.

For More Information

http://www.epa.gov/owow/STORET/

Index of Watershed Indicators

The EPA Office of Water and its many public and private partners developed the Index of Watershed Indicators (IWI) to present the health of the nation's aquatic resources. IWI is designed to collect,

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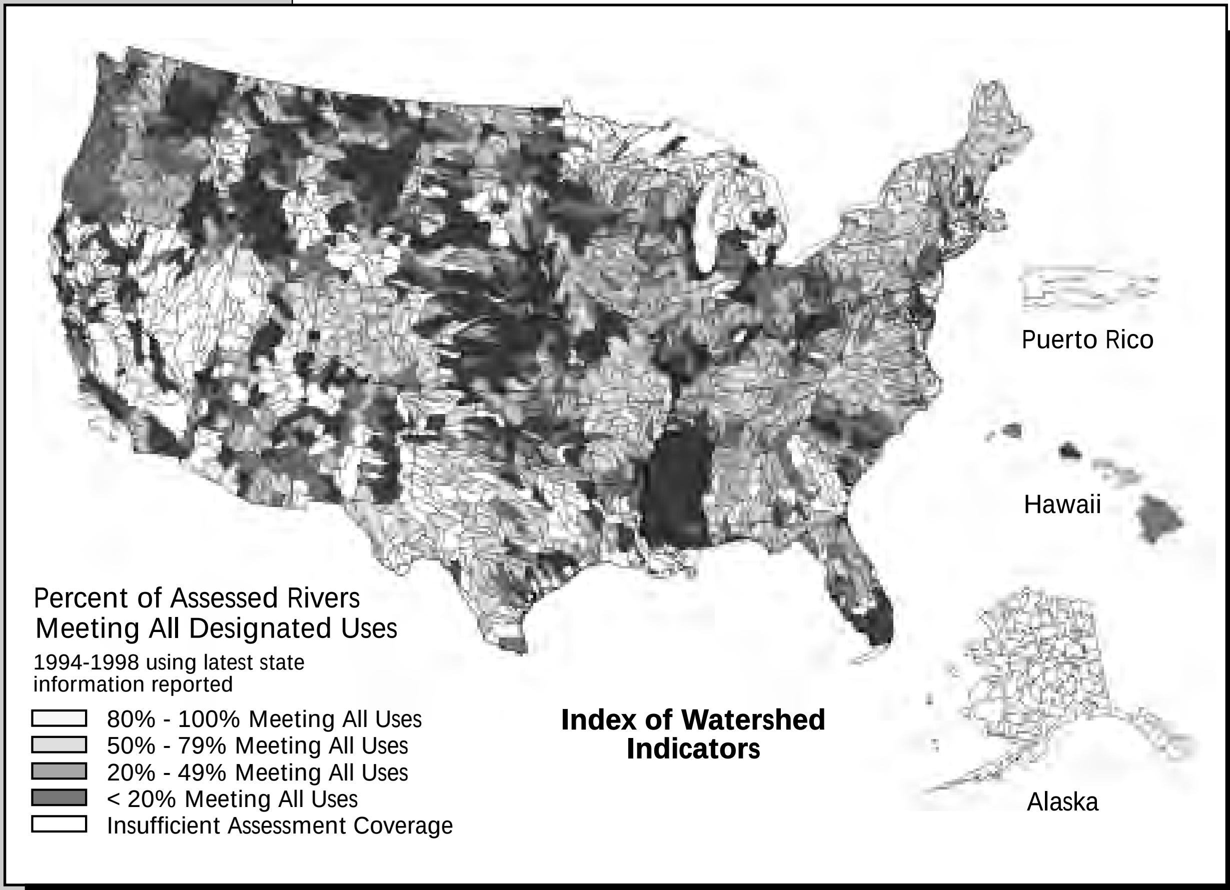
organize and evaluate multiple sources of environmental information on a watershed basis. The individual indicators presented in the IWI are developed to provide information on the health of watersheds in an easy to understand format. The goals of IWI are to

- Depict the current condition of the watershed and indicate its vulnerability to future degradation
- Educate and empower citizens through easy access to both summary information and the underlying details
- Provide a set of tools for water resource managers at all watershed scales
- Help measure progress toward watershed goals.



IWI contains tools and resources that allow users to find and manipulate data on a watershed. For example, Locate Your Watershed allows users to find their watershed using the county name or place name or by picking it off a map. A variety of options provide ways to find drinking water sources for a particular watershed or county. Enviromapper for Watersheds provides interactive geographic information system (GIS) functionality using environmental spatial data. The Map Library serves as an atlas of watershed data layers. It provides links to on-line collections of maps for viewing.

Some of the data layers include

- 305(b) water quality assessment results (see figure)
- 303(d) impaired waters
- Unified Watershed Assessment rankings
- Waters supporting drinking water use
- Contaminated sediments
- Ambient water quality data
- Urban runoff potential
- Agricultural runoff potential.

For More Information

http://www.epa.gov/surf/iwi

Reach Indexing Tool

The Reach Indexing Tool (RIT) is a software tool designed to assist users in the process of linking water quality information to the EPA Reach File 3 (RF3). RF3 is a hydrographic database that displays waters at a scale of 1 to 100,000. During the reach indexing process, waterbody identifiers from a state's database become linked or georeferenced to the appropriate RF3 stream segments. This allows the information contained in the database to be mapped.

In an ongoing effort to supply readily available information to the public, EPA is mapping information to improve its usefulness. For example, states recently submitted revised 303(d) lists of impaired waters. EPA worked with the states to generate maps showing the location of these waters. A national map of the 303(d) listed waters is available as an IWI data layer. Individual state maps can also be accessed on the IWI web page using Locate Your Watershed at *http://www.epa.gov/surf/locate*.

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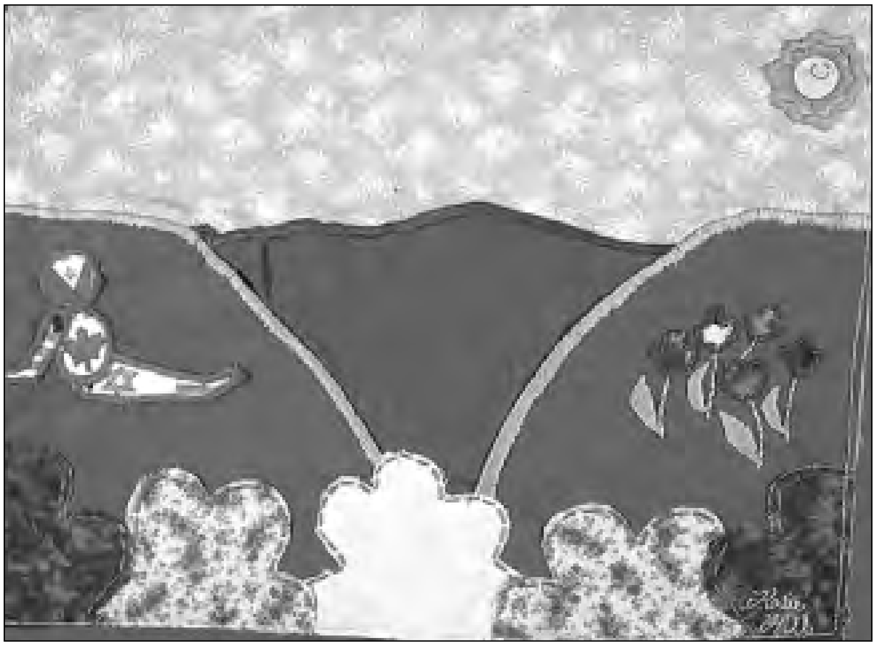
Watershed Information Network

The Internet-based Watershed Information Network (WIN) is a roadmap of consolidated watershed information and services to help communities protect and restore water quality. A tremendous amount of water quality information is now easier to find and understand, and new information and features are continually being added to WIN.

WIN can help citizens answer questions such as what is my watershed address, what is the health of my watershed, what data maps and assistance are available for my watershed, and how can I get involved in protecting and restoring water quality. Decision makers can use it in watershed protection and restoration activities.

For More Information

http://www.epa.gov/win/



River of Words 1999 Finalist, Katie Hill, *A Watershed for Everyone*, Age 17, NC

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Nutrients and Pesticides: NAWQA Program Highlights National Research

Background

In 1991, Congress authorized the National Water Quality Assessment (NAWQA) Program. The purpose of the program is to understand, at a national scale, spatial water quality patterns, water quality trends over time, and how human activities and natural factors affect water quality. The U.S. Geological Survey (USGS) designed this program to focus on more than 50 river basin and aquifer systems across the United States as "study units" using a consistent, standardized, scientifically based approach. Research examines how water quality patterns are related to factors such as chemical use, land use, climate, geology, topography, and soils.

Study Design

One of the challenges and goals of the study was to identify where nutrients and pesticides commonly occur in rivers and ground water and why some land use and environmental settings are more vulnerable to contamination than others, particularly during certain times of the year. To do this, water quality was monitored seasonally as well as during high-flow events over several years at carefully chosen sites in agricultural, urban, and undeveloped (mostly forested) settings.

Selected Findings

■ **Relative levels of nutrients and pesticides contamination are closely linked to land use and to the amounts and types of chemicals used in each setting**. Some of the highest concentrations of nitrogen and herbicides were detected in samples collected from streams and shallow ground water in agricultural areas. Some of the highest concentrations of phosphorus and insecticides were detected in samples collected from urban streams (see Table 1).

■ **Streams and ground water in basins with significant agricultural or urban development, or with a mix of these land uses, almost always contain complex mixtures of nutrients and pesticides**. Concentrations of nitrogen and phosphorus commonly exceed levels that can contribute to excessive plant growth in streams. The most prevalent nitrate contamination was

Results compiled from the first 20 NAWQA study units are available in the report *The Quality of Our Nation's Waters: Nutrients and Pesticides*, USGS Circular 1225, or on the Internet at *http://water.usgs.gov/pubs/circ/circ1225/*.

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detected in shallow ground water (less than 100 feet below land surface) beneath agricultural and urban areas. Human health risks increase in those aquifers located in geologic settings, such as in sand, gravel, or karst (weathered carbonate rock), that enable rapid movement of water.

At least one pesticide was found in more than 90% of water and fish samples collected from streams and in about half of samples from shallow wells sampled in agricultural and urban areas. Concentrations of individual pesticides in samples from wells and as annual averages in streams were almost always lower than current EPA drinking water standards and guidelines. However, aquatic life may be more at risk than human health in agricultural areas.

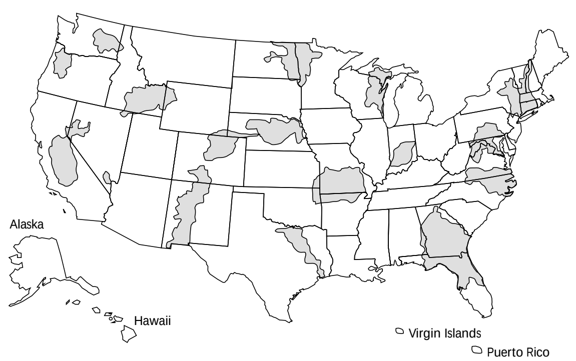


Figure 1. NAWQA Study Units

■ **Land and chemical use are important but not sole predictors of water quality**. Concentrations of nutrients and pesticides vary considerably from season to season, as well as among watersheds with differing vulnerability to contamination. The patterns reflect many factors, including soil type, slope, streamside vegetation, the frequency and magnitude of runoff from rainstorms or snowmelt, and irrigation and drainage practices. Concentrations of nutrients and pesticides are highest during rainstorms and snowmelt following chemical applications.

■ **Long-term trends are sometimes difficult to distinguish from short-term fluctuations, mainly because water quality is constantly changing from season to season and from year to year**. For many chemicals, it is too early to tell whether conditions are getting better or worse because historical data are insufficient or too inconsistent to measure trends. Despite these challenges, some trends are evident from monitoring of nutrients and pesticides. These trends show that changes in water quality over time frequently are controlled by factors similar to those that affect geographic variability, including natural features, chemical use, and management practices.

Table 1. Relative Level of Contamination

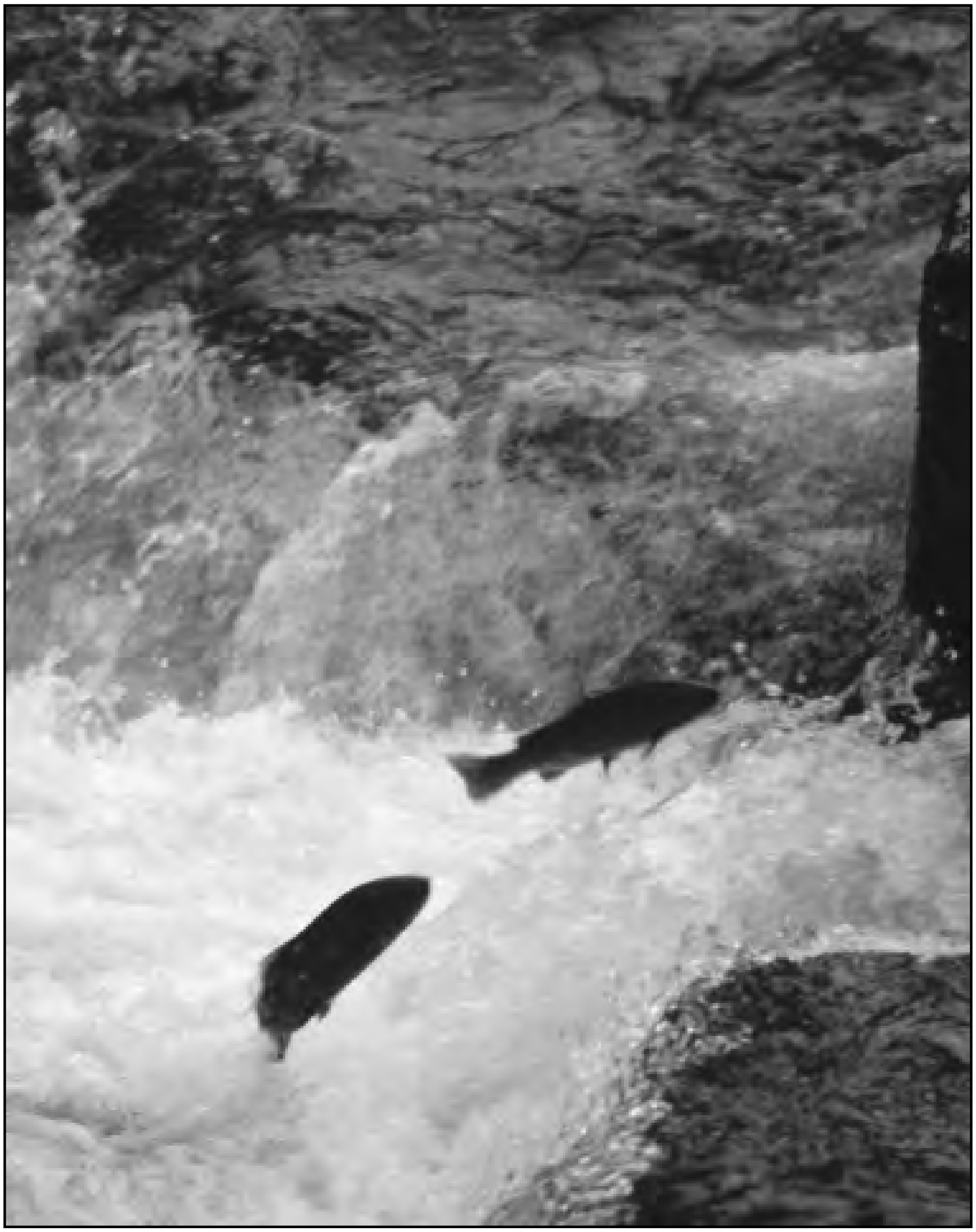
	Streams			Shallow Ground Water	
	Urban Areas	Agricultural Areas	Undeveloped Areas	Urban Areas	Agricultural Areas
Nitrogen	Medium	Medium-High	Low	Medium	High
Phosphorus	Medium-High	Medium-High	Low	Low	Low
Herbicides	Medium	Low-High	No Data	Medium	Medium-High
Currently Used Insecticides	Medium-High	Low-Medium	No Data	Low-Medium	Low-Medium
Historically Used Insecticides	Medium-High	Low-High	Low	Low-High	Low-High

Water Sheds Under Your Feet

The water under my feet moving fast to the street
flowing fast to the Anacostia, with all the trash,
sheds and puddles all in bubbles through the sewer
into the river, fast, fast, all the trash flowing right past
with all that I see and all that I saw I knew cleaning
the river would be a bore, we got together as a
team and started to clean, I looked around and
thought it was a dream I never thought the river would
get this clean, fast to the street water sheds under your feet

River of Words 1998 Anacostia Watershed Winner
Ann Shackelford, Grade 8

River of Words Finalist
Thomas Bradley, Age 13, *Beavis*, OK



John H. McShane, Yellowstone National Park

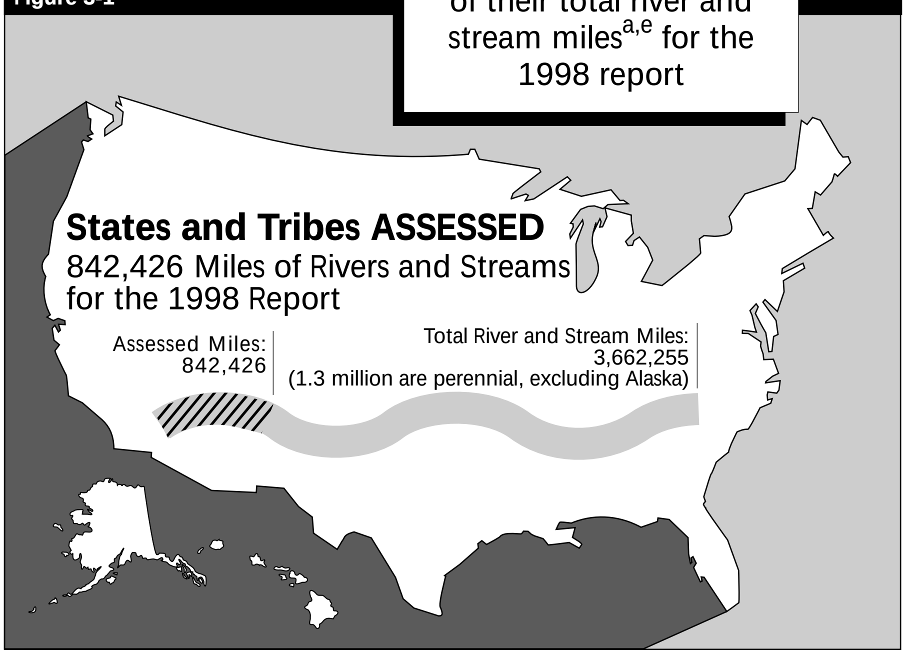
Rivers and Streams

All 50 states, 2 interstate river commissions, Puerto Rico, the District of Columbia (collectively referred to as states in the rest of this chapter), and 9 American Indian tribes rated river water quality in their 1998 Section 305(b) reports (see Appendix A, Table A-1, for individual state and tribal information). These states and tribes assessed conditions in 842,426 miles of rivers and streams or 23% of the total miles of all rivers and streams in the country (Figure 3-1). Most of the assessed rivers and streams are perennial waterbodies that flow all year. Some assessments included nonperennial streams that flow only during wet periods.

Altogether, the states and tribes assessed 148,519 more river and stream miles in 1998 than 1996. This is a 21% increase over the 693,905 miles assessed in 1996. The states of Alaska, Idaho, and Oregon, which did not provide assessment information in 1996, collectively reported on more than 66,000 river and stream miles in

States and Tribes
ASSESSED
23%
of their total river and stream miles[a,e] for the 1998 report

Figure 3-1

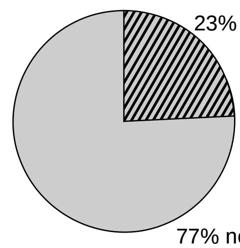


This figure compares the total miles of rivers and streams (combination of perennial and intermittent) with the subset that were assessed by states for the 1998 water quality report.

Based on data contained in Appendix A, Table A-1.

River and Stream Miles Assessed by States and Tribes

1998 842,426 miles = 23% assessed
Total miles: 3,662,255[a,e]



1996 693,905 miles = 19% assessed
Total miles: 3,634,152[b]

1994 615,806 miles = 17% assessed
Total miles: 3,548,738[c]

1992 642,881 miles = 18% assessed
Total miles: 3,551,247[d]

[a]Source: 1998 state and tribal section 305(b) reports.
[b]Source: 1996 state and tribal section 305(b) reports.
[c]Source: 1994 state and tribal section 305(b) reports.
[d]Source: 1992 state and tribal section 305(b) reports.
[e] The total number of river and stream miles reported by the states increased between 1996 and 1998 due primarily to Pennsylvania's switch to atlas values based on a higher resolution hydrography database.

1998. Other states reported significant increases in assessed river and stream miles because of changes in their monitoring program or assessment process.

For example, Delaware more than doubled the number of assessed river and stream miles in the state, representing an increase of more than 1,600 miles, due to more comprehensive coverage of the state's waters using the rotating basin approach.

The states and tribes used recent monitoring data to assess 43% of their assessed river and stream miles (see Appendix A, Table A-2, for individual state and tribal information). Evaluated assessments, based on qualitative information or monitoring information more than 5 years old, were used for 45% of the assessed river and stream miles. States did not specify whether the remaining 12% of assessed river and stream miles were monitored or evaluated. Compared to the 1996 reporting cycle, states are using monitoring data for a smaller percentage of their assessments. In 1996, states used monitoring data in 51% of their river and stream assessments.

The summary information presented in this chapter applies strictly to the portion of the nation's rivers assessed by the states and tribes. EPA cannot make generalizations about the health of all of our nation's rivers based on data extracted from the 305(b) reports.

The primary reason the assessment results cannot be used to characterize nationwide water quality is that states have not achieved comprehensive assessment of all rivers and streams. Another factor is the monitoring design used to collect data. Very few states or tribes use a statistical design to randomly select water sampling sites that represent a cross section of water quality conditions in their jurisdictions. Instead, many states and tribes direct their limited monitoring resources toward waters with suspected problems.

However, more than half of the states are working to achieve comprehensive assessments. See the highlight on page 24 for a description of some of the approaches used. One approach, called rotating basins, involves intensive monitoring in different selected basins each year. Another approach, called probability-based monitoring, involves statistical design that provides statewide characterization. Some states, such as West Virginia, use both approaches. See the highlight on page 54 for a description of West Virginia's approach for achieving comprehensive assessments.

National data from other federal agencies, such as those described in Chapter 2, and private organizations will also clarify national water quality trends. In fact, the U.S. Geological Survey recently published a report comparing nutrient and pesticide levels in natural, agricultural, and urban streams in 20 study units across the country. See the highlight on page 66 for a brief description of these findings.

Water Quality Assessment

States and tribes rate water quality by comparing data to standards. Water quality standards include narrative and numeric criteria that support specific designated uses. Standards also specify goals to prevent degradation of good quality waters.

States and tribes use their numeric and narrative criteria to evaluate whether the designated uses assigned to the waterbodies are supported. Designated uses reflect the goals of the Clean Water Act. They aim to protect human health and the biological integrity of aquatic ecosystems. The most common designated uses are

- Aquatic life support
- Drinking water supply
- Recreation such as swimming, fishing, and boating
- Fish consumption.

After comparing water quality data to standards, states and tribes classify the waters into the following categories:

■ **Good/Fully Supporting:** Good water quality supports a diverse community of fish, plants, and aquatic insects, as well as the array of human activities assigned to a river by the state. These waters meet applicable water quality standards, both criteria and designated use.

■ **Good/Threatened:** Good water quality currently supports aquatic life and human activities in and on the river. These waters are currently meeting water quality standards, but states and tribes are concerned they may degrade in the near future. These concerns are based on a trend of increasing pollution or land use changes that may threaten future water quality.

■ **Fair/Partially Supporting:** Fair water quality supports aquatic communities with fewer species of fish, plants, and aquatic insects and/or pollution occasionally interferes with human activities. These waters are meeting water quality standards most of the time, but exhibit occasional exceedances. For example, occasional siltation problems may reduce the population of some aquatic species in a river although other species are not affected.

■ **Poor/Not Supporting:** Poor water quality does not support a healthy aquatic community and/or prevents some human activities on the river. These waters are not meeting water quality standards. For example, persistent PCB contamination in river sediments (originating from discontinued industrial discharges) may contaminate fish and make the fish inedible for years.

■ **Not Attainable:** The state has performed a use-attainability analysis and demonstrated that support of one or more designated beneficial uses is not attainable due to specific biological, chemical, physical, or economic/social conditions (see Chapter 1 for additional information).

Summary of Use Support

Most states and tribes rate how well a river supports individual uses (such as swimming and aquatic life) and then consolidate individual use ratings into a summary table. This

65% OF ASSESSED river and stream miles have good water quality.

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State Progress Toward Comprehensive Assessments: West Virginia Example

For the 1998 305(b) cycle, states began developing plans to achieve more comprehensive assessments of their waters. The EPA Guidelines made several recommendations on promising techniques. States were encouraged to build on these suggestions and to pursue other promising strategies. Some key concepts are to

- Fit monitoring and survey work within rotating basin assessment and management plans

- Seek partnerships among other natural resources agencies and support from locally based volunteer monitoring groups

- Leverage resources among different programs through state Performance Partnership Agreements (PPAs)

- Organize site-specific survey work to support development of environmental indicators for different spatial scales ranging from small watersheds to an entire state

- Consider innovative new techniques such as probability-based surveys.

The experiences of West Virginia illustrate how states are working to implement sound approaches for more comprehensive assessments.

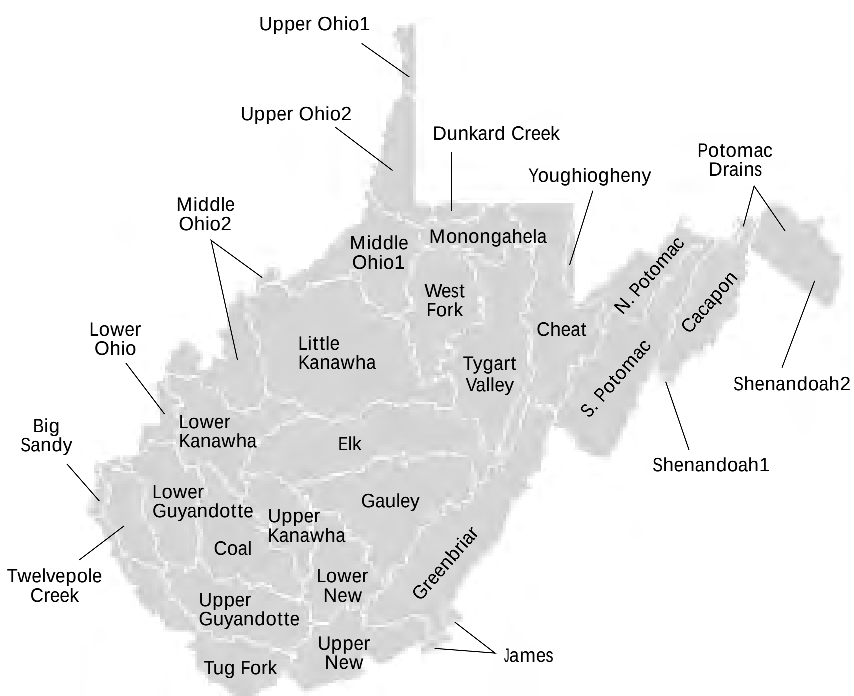

Figure 1. West Virginia's Major Watershed Management Basins

West Virginia's Watershed Management Framework

The foundation of West Virginia's assessment program is their Watershed Management Framework (WMF), which includes a rotating basin monitoring approach. The major steps in the West Virginia rotating basin system depend on reliable assessment information to define watershed management objectives within each of their major basins. As management plans are developed and implemented, an iterative process then applies new assessments to document progress and to make any needed mid-course adjustments. To ensure involvement from all major stakeholders, an Interagency Watershed Steering Committee (IWMSC) was created composed of representatives from 12 state and federal agencies. A Citizens Stream Monitoring initiative seeks grass-roots involvement from volunteer persons in local watershed groups. This program was assisted through a "Save Our Streams" grant from EPA and technical support through the Izaak Walton League. In addition to valuable assessment inputs, the West Virginia Citizen Stream Monitoring activities help ensure public participation in all phases of the rotating basin management system.

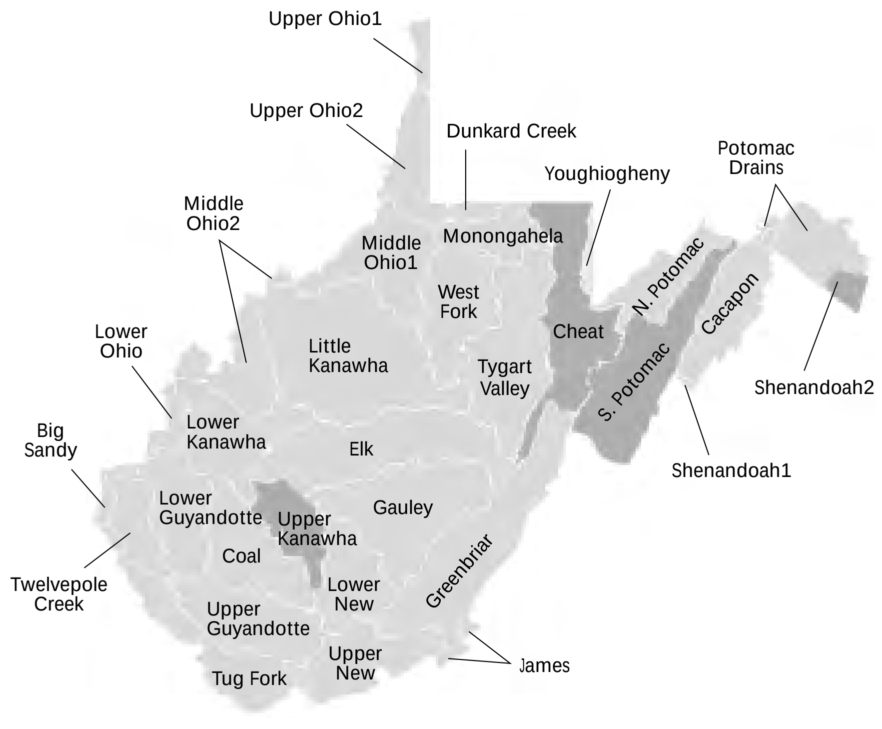

Figure 2. Shaded Basins Were Surveyed and Included in West Virginia's 1998 305(b) Report

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The first results from West Virginia's new rotating basins approach are reflected in their 1998 305(b) report. For the Cheat River, the Shenandoah River, the South Branch of the Potomac River, the Upper Kanawah River, the Upper (North) Ohio River, and the Youghiogheny River, major new sampling efforts were undertaken applying rigorous quality assurance and bioassessment techniques to document the status of aquatic life support.

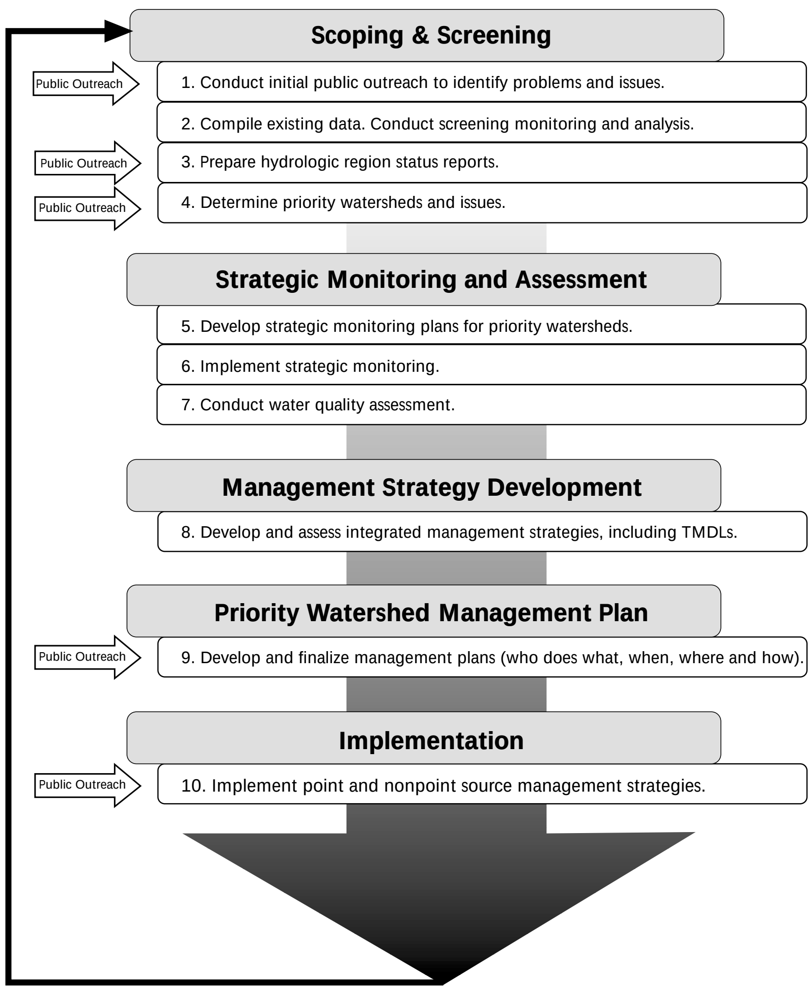


Figure 3. Steps in West Virginia's Rotating Basins Watershed Management Cycle

Probability-Based Monitoring in West Virginia

To improve the reliability of their assessments, West Virginia is also incorporating probability-based sampling techniques into their rotating basin surveys. A major attraction is the potential to document more precisely the extent and severity of acid mine drainage problems. These concerns can impact both larger rivers and smaller tributary streams but are most commonly encountered in upland areas on small headwater streams. West Virginia is working with EPA's Office of Research and Development to prototype a stratified random sampling approach aimed at providing a baseline for all streams but also for a special subpopulation of the smaller headwater streams. This is a particularly appropriate application of randomized surveys since it is not feasible to expect sampling for each of the thousands of headwater streams in the state. Within a few years, West Virginia will be able to compare the findings from its traditional nonrandomized site surveys with the new random surveys to develop statistically reliable estimates of conditions on both watershed and statewide spatial scales.

Conclusion

West Virginia is implementing key components needed to achieve comprehensive assessments of its water resources through

- Increased interagency cooperation
- Constructive involvement of grassroots watershed organizations and other stakeholders
- Application of new monitoring approaches
- A more flexible application of conventional assessment techniques through their rotating basin system.

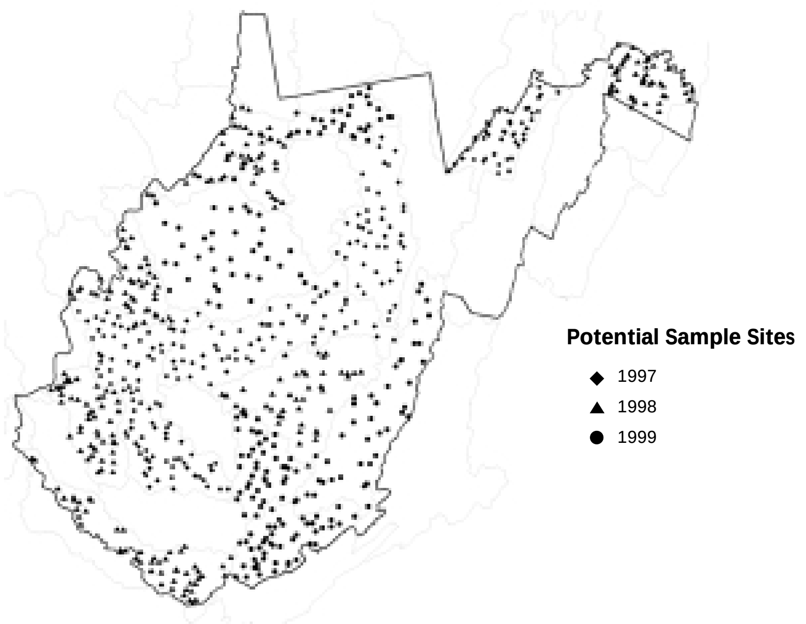


Figure 4. West Virginia Stream Samples – Rotating Basins

Assessed Waters

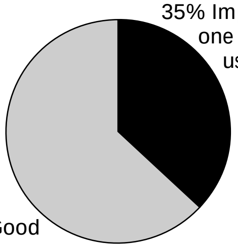
Total rivers and streams = 3,662,255 miles[a]
Total assessed = 842,426 miles

■ 23% assessed
■ 77% not assessed

Of the assessed miles:

- 43% were monitored
- 45% were evaluated
- 12% were not specified

Summary of Assessed Water Quality



[a]Source: 1998 state and tribal Section 305(b) reports.

table divides assessed rivers into those miles that are

■ **Good** – Fully supporting all of their uses or fully supporting all uses but threatened for one or more uses

■ **Impaired** – Partially or not supporting one or more uses

■ **Not attainable** – Not able to support one or more uses.

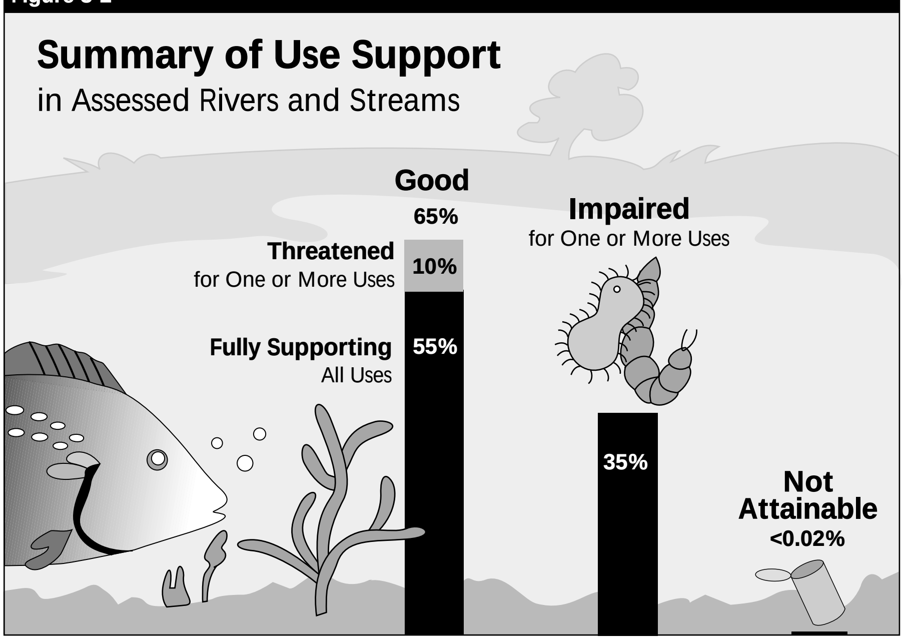
Forty-seven states, eight tribes, two interstate commissions, Puerto Rico, and the District of Columbia reported summary use support status for rivers and streams in their 1998 Section 305(b) reports (see Appendix A, Table A-2, for individual state and tribal information). Another three states and four tribes reported individual use support status but did not report summary use support status. In such cases, EPA used either aquatic life or swimming use support status to represent summary water quality conditions in the state's or tribe's rivers and streams.

In addition, the Susquehanna River Basin Commission provided use support information that was not included in the totals presented here because the waters in their jurisdiction overlap with waters in New York, Pennsylvania, and Maryland.

It is important to note that nine states did not include the effects of statewide fish consumption advisories for mercury when calculating their summary use support status in rivers and streams. Connecticut, Indiana, Maine, Massachusetts, New Hampshire, New Jersey, North Carolina, and Vermont excluded the impairment associated with statewide mercury advisories in order to convey information that would have been otherwise masked by the fish consumption advisories. Because Ohio's summary of use support was based only on aquatic life use support data, it does not include the effect of the state's statewide mercury advisory either. If these advisories had been included, all of the states' rivers and streams would have received an impaired rating. (See the discussion of mercury in Chapter 4.)

New York also excluded the effect of a statewide PCB/chlordane/mirex/DDT fish consumption advisory for rivers and streams in its summary data.

Figure 3-2



This figure presents the status of the assessed miles of rivers and streams. Of the more than 800,000 miles of rivers and streams assessed, 65% fully support their designated uses and 35% are impaired for one or more uses. Ten percent of the assessed waters are fully supporting uses but threatened.

Based on data contained in Appendix A, Table A-2.

Altogether, states and tribes reported that 65% of 840,402* assessed river and stream miles fully support all of their uses. Of the assessed waters, 55% fully support designated uses and 10% fully support all uses but are threatened for one or more uses. These threatened waters may need special attention and additional monitoring to prevent further deterioration (Figure 3-2). Some form of pollution or habitat degradation impairs the remaining 35% of the assessed river and stream miles.

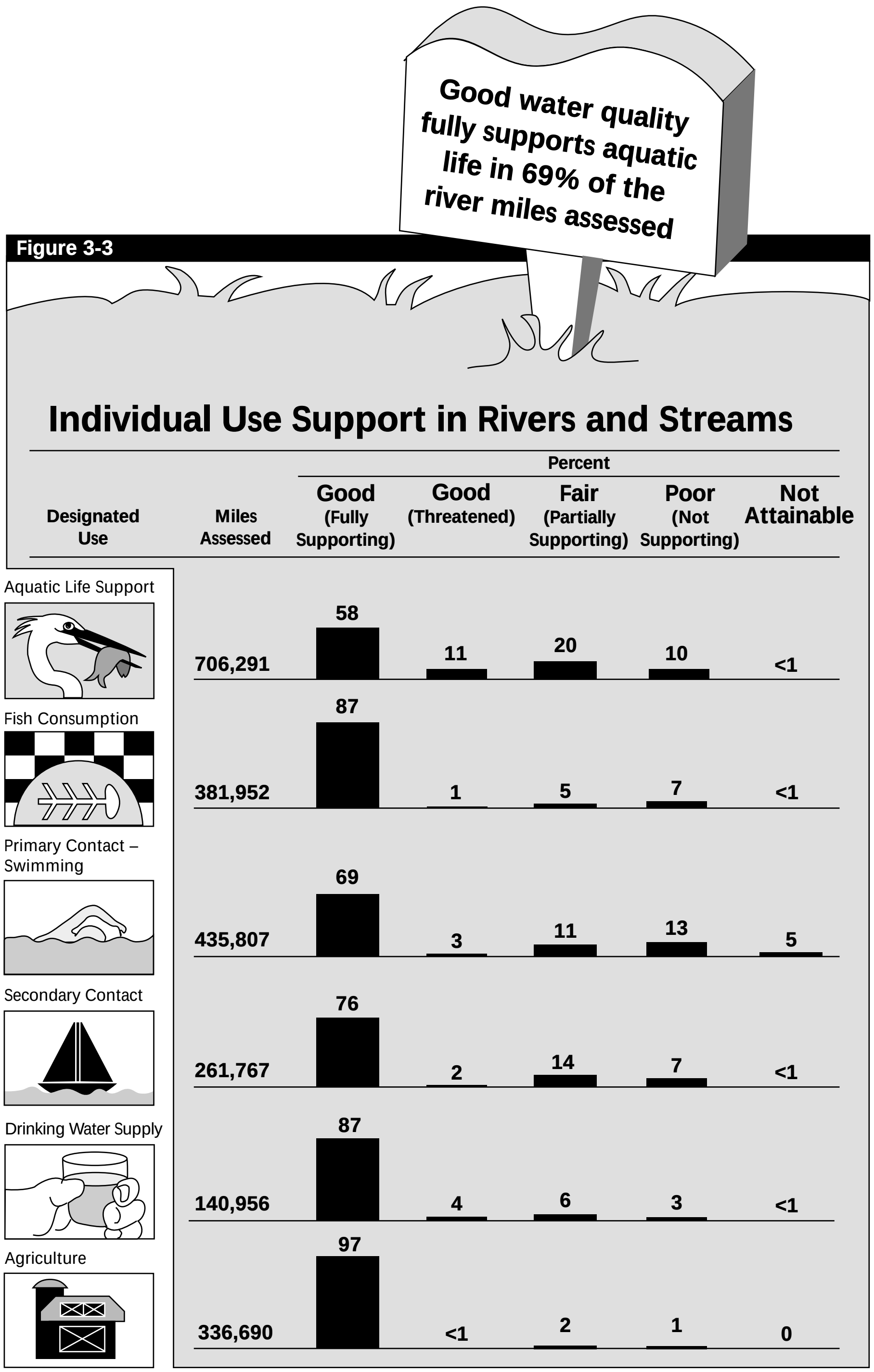
Individual Use Support

Individual use support assessment provides important detail about the nature of water quality problems in our nation's surface waters. The states establish specific designated uses for waterbodies through their water quality standards. The states consolidate their more detailed uses into six general use categories so that EPA can present a summary of the state and tribal data.

- Aquatic life support – Is water quality good enough to support a healthy, balanced community of aquatic organisms, including fish, plants, insects, and algae?
- Fish consumption – Can people safely eat fish caught in the river or stream?
- Primary contact recreation (swimming) – Can people make full body contact with the water without risk to their health?
- Secondary contact recreation – Is there a risk to public health from recreational activities on the water, such as boating, that expose the public to minimal contact with the water?
- Drinking water supply – Can the river or stream provide a safe water supply with standard treatment?
- Agricultural uses – Can the water be used for irrigating fields and watering livestock?

Only four states did not report individual use support status of their rivers and streams (see Appendix A, Table A-3, for individual state and tribal information). The reporting states and tribes assessed the status of aquatic life and swimming uses most frequently (see Figure 3-3) and identified more impacts on aquatic life and swimming uses than on the other individual uses. These states and tribes reported that fair or poor water quality impacts aquatic life in 216,881 stream miles (30% of

*This value does not equal the 842,426 assessed miles because every state did not account for all assessed river and stream miles in the Summary of Use Support.



This figure presents a tally of the miles of rivers and streams assessed by states for each category of designated use. For each category, the figure presents a summary of the proportion of the assessed waters rated according to quality.

Based on data contained in Appendix A, Table A-3.

the 706,291 miles assessed for aquatic life support). Fair or poor water quality conditions also impair swimming activities in 101,210 miles (24% of the 435,807 miles assessed for swimming use support).

Many states and tribes did not rate fish consumption use support because they have not included fish consumption as a use in their standards. EPA encourages the states to designate fish consumption as a use in their waterbodies to ensure this use is protected and to promote consistency in future reporting. Most states report information on fish consumption advisories to EPA (see Chapter 8). Fish consumption advisories identify the species or size of fish that should not be eaten or limit the quantities of fish that should be eaten.

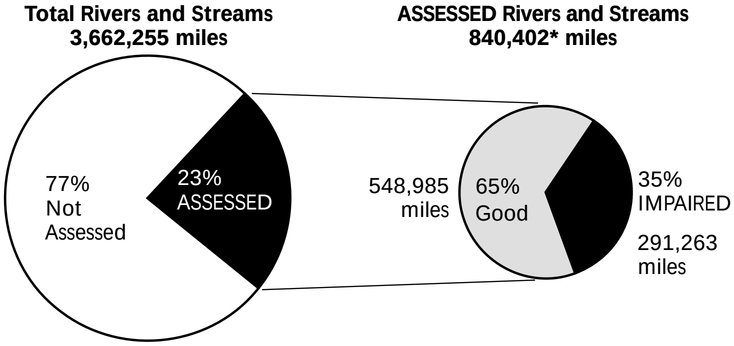
Water Quality Problems Identified in Rivers and Streams

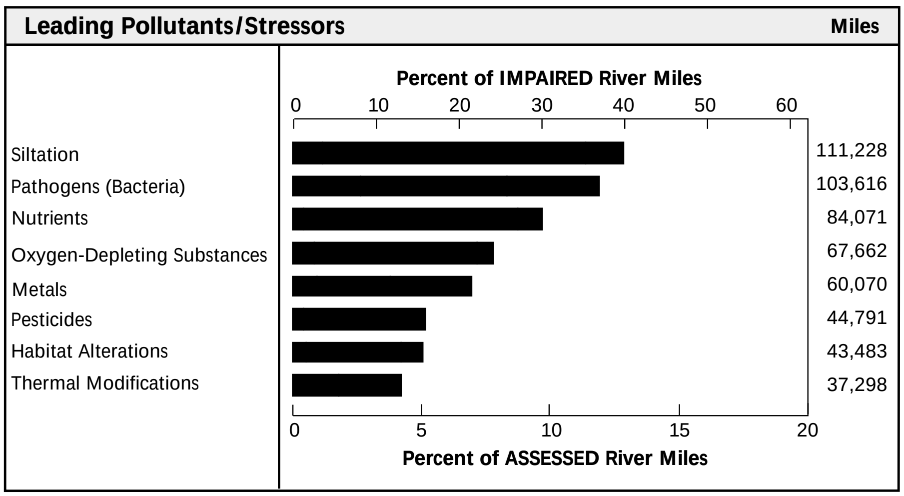
When states and tribes rate waters as impaired, they also attempt to identify the causes and sources of impairment. Figures 3-4 and 3-5 identify the pollutants and sources of pollutants that impair the most river and stream miles.

The following sections describe the leading pollutants and sources of impairment in rivers as identified by the states and summarized by EPA. It is important to note that the information about pollutants and sources is incomplete because the states do not identify the pollutant or source of pollutants responsible for every impaired river segment.

Figure 3-4

Leading POLLUTANTS in Impaired Rivers and Streams





States assessed 23% of the total miles of rivers and streams for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 65% are rated as good and 35% as impaired. When states identify waters that are impaired, they describe the pollutants or processes causing or contributing to the impairment. The bar chart presents the leading causes and the number of river and stream miles impacted. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these pollutants. The lower axis compares the miles impacted by the pollutant to the total ASSESSED miles. The upper axis compares the miles impacted by the pollutant to the total IMPAIRED miles.

Based on data contained in Appendix A, Table A-4.

*Includes miles assessed as not attainable.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a river segment.

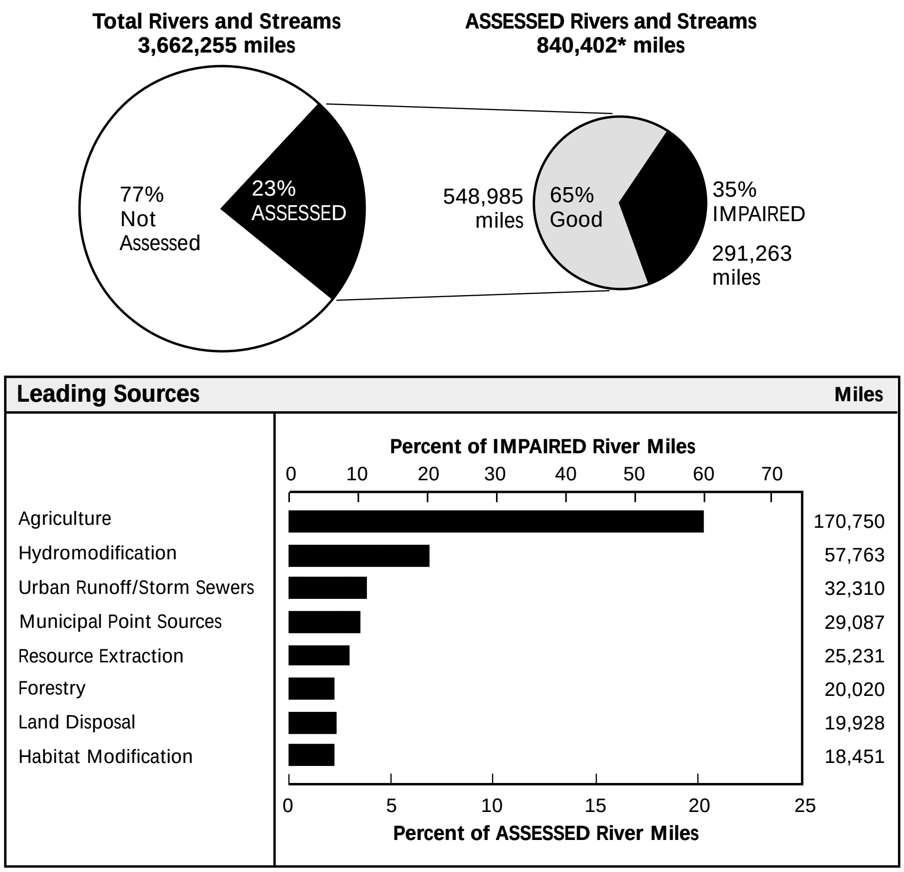
The pollutants/processes and sources shown here may not correspond directly to one another (i.e., the leading pollutant may not originate from the leading source). This may occur because a major pollutant may be released from many minor sources. It also happens when states do not have the information to determine all the sources of a particular pollutant/stressor.

SILTATION is the most common pollutant affecting assessed rivers and streams. Siltation

- Is found in 13% of the assessed rivers and streams (see Figure 3-4).
- Contributes to 38% of reported water quality problems in impaired rivers and streams.

Figure 3-5

Leading SOURCES of River and Stream Impairment†



States assessed 23% of the total miles of rivers and streams for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 65% are rated as good and 35% as impaired. When states identify waters that are impaired, they also describe the sources of pollutants associated with the impairment. The bar chart presents the leading sources and the number of river and stream miles they impact. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these sources. The lower axis compares the miles impacted by the source to the total ASSESSED miles. The upper axis compares the miles impacted by the source to the total IMPAIRED miles.

Based on data contained in Appendix A, Table A-5.

†Excluding unknown and natural sources.

*Includes miles assessed as not attainable.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a river segment.

AGRICULTURE is the leading source of pollution in assessed rivers and streams. According to the states, agricultural pollution problems

- Affect 20% of the assessed rivers and streams
- Contribute to 59% of reported water quality problems in impaired rivers and streams (see Figure 3-5).

In some cases, a state may recognize that water quality does not fully support a designated use, but the state may not have adequate data to document that a specific pollutant or stressor is responsible for the impairment. Sources of impairment are even more difficult to identify than pollutants and stressors.

Pollutants and Stressors Impacting Rivers and Streams

A total of 60 tribes and states reported the number of river and stream miles impacted by individual pollutants and stressors, such as invasive species (see Appendix A, Table A-4, for individual state and tribal information).

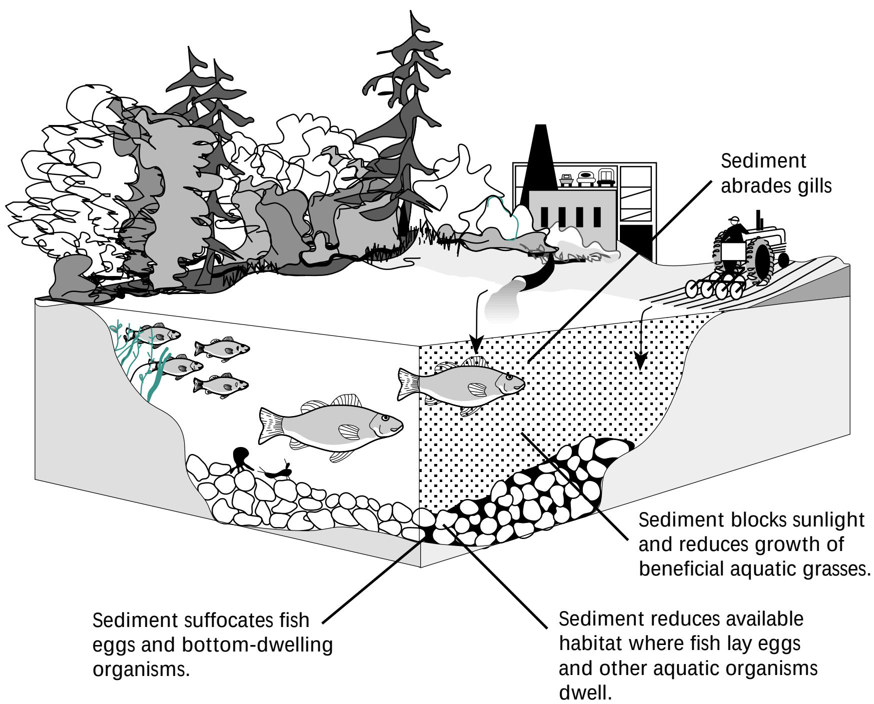
The states and tribes report that siltation, composed of tiny soil particles, remains one of the most widespread pollutants impacting assessed rivers and streams. Siltation impaired 111,228 river and stream miles (13% of the assessed river and stream miles and 38% of the impaired river and stream miles). Siltation alters aquatic habitat and suffocates fish eggs and bottom-dwelling organisms (see Figure 3-6). Aquatic insects live in the spaces between cobbles, and their habitat is destroyed when silt fills in these spaces. The loss of aquatic insects adversely impacts fish and other wildlife that eat these insects. Excessive siltation can also interfere with drinking water treatment processes and recreational use of a river. Sources of siltation include agriculture, urban runoff, construction, and forestry.

The states and tribes report that bacteria (pathogens) pollute 103,616 river and stream miles (12% of the assessed river and stream miles and 36% of the impaired river and stream miles). Bacteria provide evidence of possible fecal contamination that may cause illness if the public ingests the water. States use bacterial indicators to determine if rivers are safe for swimming and drinking. Bacteria commonly enter surface waters in inadequately treated sewage, fecal material from wildlife, and runoff from pastures, feedlots, and urban areas.

Nutrient pollution was also reported as a significant cause of

Figure 3-6

The Effects of Siltation in Rivers and Streams



Siltation is one of the leading pollution problems in the nation's rivers and streams. Over the long term, unchecked siltation can alter habitat with profound adverse effects on aquatic life. In the short term, silt can kill fish directly, destroy spawning beds, and increase water turbidity resulting in depressed photosynthetic rates.

Identifying Sources Is a Challenge

It is relatively easy to collect a water sample and identify pollutants causing impairments, such as fecal coliform bacteria indicating pathogen contamination. However, detecting and ranking sources of pollutants can require monitoring pollutant movement from numerous potential sources, such as failing septic systems, agricultural fields, urban runoff, municipal sewage treatment plants, and local waterfowl populations. Often, states are not able to determine the particular source responsible for impairment. In these cases, many states report the source of impairment as "unknown." In the 1998 305(b) reports, states reported unknown sources impairing 30,499 river and stream miles (4% of the assessed river and stream miles).

water quality impairment in the 1998 305(b) reports, with states and tribes reporting impacts to 84,071 river and stream miles (10% of the assessed river and stream miles and 29% of the impaired river and stream miles). While nutrient pollution has been an ongoing problem in the nation's lakes and ponds (see Chapter 4), it is getting increased attention because of its effects on rivers and streams, particularly those that flow to sensitive estuarine and coastal waters (see Chapter 5). Excessive levels of nitrogen and phosphorus may accelerate growth of algae and underwater plants, depleting the water column of dissolved oxygen necessary to maintain populations of fish and desirable plant species. Nutrients may enter rivers and streams from municipal and industrial wastewater treatment discharges and runoff from agricultural lands, forestry operations, and urban areas.

In addition to siltation, bacteria, and nutrients, the states and tribes also reported that oxygen-depleting substances, metals, pesticides, habitat alterations, and thermal modifications impact more miles of rivers and streams than other pollutants and stressors. Often, several pollutants and stressors impact a single river segment. For example, the removal of shoreline vegetation may accelerate erosion of sediment and nutrients into a stream. In such cases, the states and tribes count a single mile of river under each pollutant and stressor category that impacts the river mile. Therefore, the river and stream miles impaired by each pollutant or stressor do not add up to 100% in Figure 3-4.

This presentation ranks pollutants and stressors by the geographic extent of their impacts (i.e., the number of miles impaired by each pollutant or stressor). However, less abundant pollutants or stressors may have more severe impacts on short stream segments. For example, a toxic chemical spill can eliminate aquatic life in a short stream segment while widely distributed bacteria do not affect aquatic life but occasionally indicate a potential human health hazard from swimming. The individual state and tribal 305(b) reports provide more detailed information about the severity of pollution in specific locations.

Sources of Pollutants Impacting Rivers and Streams

A total of 59 tribes and states reported sources of pollution related to human activities that impact some of their rivers and streams (see Appendix A, Table A-5, for individual state and tribal information). These states and tribes reported that agriculture is the most widespread source of pollution in the nation's assessed rivers. After agriculture, the states and tribes reported that hydromodification, urban runoff and storm sewers, and municipal discharges are the most common sources of impairment to rivers and streams.

■ Agriculture – Agriculture is listed as a source of pollution for 170,750 river and stream miles, or about 20% of assessed river and stream miles (Figure 3-5). While this number is significant, it must be viewed in light of the magnitude of the agricultural sector in the United States. According to the 1997 Census of Agriculture, 41% of the continental United States, about 900 million acres, is used for agricultural production. Cropland accounts for about 46% of the agricultural land. Pasture and range land make up another 43%.

Of the 53 states and tribes that reported impairment from agriculture, 28 reported the number of river and stream miles impacted by specific types of agricultural activities:

- Nonirrigated Crop Production – crop production that relies on rain as the sole source of water.

- Irrigated Crop Production – crop production that uses irrigation systems to supplement rainwater.

- Range Grazing – land grazed by animals that is seldom enhanced by the application of fertilizers or pesticides, although land managers sometimes modify plant species to a limited extent.

- Pasture Grazing – land upon which a crop (such as alfalfa) is raised to feed animals, either by grazing the animals among the crops or harvesting the crops. Pasture land is actively managed to encourage selected plant species to grow, and fertilizers or pesticides may be applied more often on pastureland than rangeland.

- Animal Feeding Operations – either Concentrated Animal Feeding Operations (permitted point source) or Animal Feeding Operations (nonpoint source).

  – Concentrated Animal Feeding Operations (permitted point source) – facilities in which animals are confined, fed, and maintained for some period of time throughout the year where discharges are regulated through the National Pollutant Discharge Elimination System.

  – Animal Feeding Operations (nonpoint source) – facilities in which animals are confined, fed, and maintained for some period of time throughout the year that are considered nonpoint sources according to the Clean Water Act.

The 28 states and tribes that reported the number of river and stream miles impacted by specific types of agricultural activities identified the most miles impaired by nonirrigated crop production. These states and tribes report that nonirrigated crop production degrades 46,484 miles (27% of the 170,750 miles impaired by agriculture). Following nonirrigated crop production, the states and tribes report that irrigated crop production degrades 31,156 miles (18% of the 170,750 miles impaired by agriculture). The states and tribes also report that animal feeding operations pollute 27,751 miles (16% of the 170,750 miles impaired by agriculture), range grazing degrades 19,469 miles (11% of the 170,750 miles impaired by agriculture), and pasture grazing degrades 10,597 miles (6% of the 170,750 miles impaired by agriculture).

Runoff from irrigated and nonirrigated cropland may contain nutrients (nitrogen and phosphorus), pesticides, and soil particles.

Some pollutant sources play a more significant role at a local level.

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Nutrients in Streams: Findings of the U.S. Geological Survey NAWQA Program

As described in Chapter 2, Congress established the National Water Quality Assessment (NAWQA) Program in 1991. The U.S. Geological Survey (USGS) implements this program to examine water quality patterns and trends across the United States. USGS recently released a report analyzing the results of water quality monitoring at 20 study units across the country (USGS, 1999, *The Quality of Our Nation's Waters—Nutrients and Pesticides: U.S. Geological Survey Circular (1225)*).

Nutrient levels in streams affected by different land use activities were one aspect of the USGS report. For this report, USGS looked at data from streams on concentrations of total nitrogen and total phosphorus. It compared the concentrations found in agricultural areas, urban areas, and undeveloped areas. Summaries of these data are presented in Figures 1 and 2.

The highest total nitrogen and phosphorus concentrations were found in streams draining watersheds with large amounts of agricultural and urban land uses. These data support the growing understanding of the contribution of human activities, including the amounts and timing of fertilizer and manure applications and land- and water-management practices, on levels of nitrogen and phosphorus in streams.

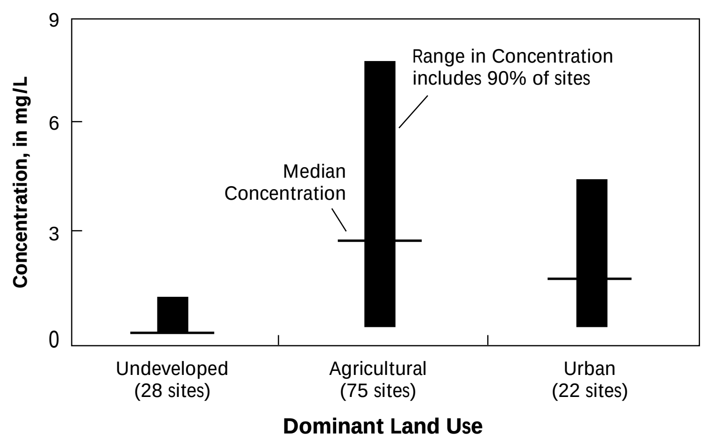

Figure 1. Total Nitrogen in Streams

Nitrogen

In more than half of sample streams, total nitrogen concentrations were above background levels. High concentrations of nitrogen in streams in agricultural watersheds correlated with nitrogen inputs from fertilizer and manure applications and from livestock wastes. Elevated levels of nitrogen in urban streams are probably due to a combination of sources including fertilizers used on lawns and golf courses, emissions from vehicles and power plants, and discharges from municipal wastewater treatment plants.

Phosphorus

Total phosphorus levels were above background levels in most streams sampled. About half of the urban streams sampled had average annual concentrations that ranked among the highest in the study. This was especially evident in the semiarid western and southwestern regions where discharges from wastewater treatment plants contribute a large portion of streamflow. However, phosphorus concentrations have decreased during the last 10 years as a result of reductions in the use of phosphate detergents and upgrades to wastewater treatment plants.

The USGS report concluded that human activities have increased nutrient levels above background concentrations in streams. In most cases, enrichment of streams with nutrients occurred in small watersheds and/or regions dominated by agricultural or urban land use.

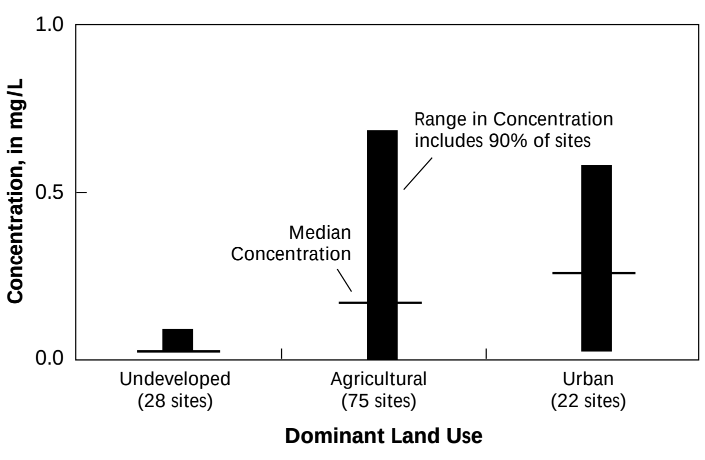

Figure 2. Total Phosphorus in Streams

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Agricultural Water Quality Accomplishments

Agriculture is recognized in watersheds across the country as a source of nonpoint source pollution. On the other hand, agricultural land use is recognized in many areas as a "preferred" use for environmental, social, and economic purposes. Addressing problems caused by various agricultural activities while maintaining the overall, long-term sustainability of the environment and the industry presents special challenges.

The agricultural community, through voluntary incentive-based approaches, has been responsive to the growing national concern over degradation of our nation's waters. Technical assistance and financial incentives through U.S. Department of Agriculture (USDA) programs such as the Conservation Reserve Program, the Environmental Quality Incentive Program (EQIP), and the Wildlife Habitat Incentive Program, along with numerous conservation programs at the state and local levels, have helped landowners to become better stewards of the nation's natural resources while meeting the demands of today's markets. Financial assistance provided through these programs has been especially effective in encouraging voluntary adoption of new, more environmentally sensitive practices.

Since the mid-1980s, farmers and ranchers have adopted conservation practices, also referred to as Best Management Practices (BMPs), aimed at reducing nonpoint source pollution at an ever increasing rate. For example, Lake Washington in Mississippi was severely degraded with nutrients and sediments from agricultural lands. The landowners in the watershed, working through the local soil and water conservation district, with technical assistance from the USDA's Natural Resources Conservation Service, developed a watershed management plan to address the water quality problems. In this project, landowners planned and applied BMPs to the land surrounding the lake to reduce sediment and nutrients entering the lake. Monitoring was conducted on several practices by the Mississippi Department of Environmental Quality to see how these practices affected the quality of water in the lake. As a result of BMPs installed in the project area, soil loss was reduced from more than 9.2 tons per acre per year to 2 tons per acre per year on 17,700 acres in the Lake Washington watershed. Monitoring also indicated that the installation of BMPs reduced total suspended solids entering the lake from agricultural fields by 50%, total phosphorous was reduced by 83%, and total nitrogen was reduced by 45%.

Farmers and ranchers in Medina, Uvalde, and Bandera counties in Texas are using the EQIP to protect water quality and quantity in the Edwards Aquifer. The Aquifer provides drinking water for 1.5 million people in the San Antonio area and irrigation water for 100,000 acres of farmland. Through the EQIP, crop producers have installed improved irrigation systems that save up to 50,000 gallons of water per acre per year. Ranchers have applied conservation practices to 120,000 acres of grazing land. Water yields on some grazing lands have increased by as much as 40,000 gallons per acre per year. Vegetated buffers and filter strips have been planted on 600 acres, and improved management is being practiced on 500 acres of riverbanks. As a result, sediment loading into streams, rivers, and the Edwards Aquifer has declined by 300,000 tons; pesticide and nutrient loading has declined by 545,000 pounds.

Another shining example of the agricultural community taking voluntary proactive steps to address the issue of water quality is evident in Utah. In 1991, the landowners, water users, and resource managers became alarmed that Chalk Creek was the major source of sediment delivery to the Weber River, which supplies water to Ogden and other Wasatach Mountain Range communities. To address this environmental concern, the interested parties began working together on the Chalk Creek Nonpoint Source Water Quality Project. Most of the agricultural land in the Chalk Creek watershed is in rangeland, with just 2,000 acres of cropland. By 1994, a coordinated watershed resource plan had been developed and a local Technical Advisory Committee had been formed to oversee implementation of the watershed management plan. By 1997, most of the major landowners in the watershed, working with the Summit Soil and Water Conservation District and other agencies, had begun designing resource management system plans for their own land. Through this local initiative, the community is realizing its goal of reduced sedimentation into the Weber River.

Nutrients occur naturally in the soil but are also added in the form of chemical fertilizers and manure. Rainwater and irrigation carry excess nutrients to surface waters and shallow ground water. The transport of nutrients, pesticides, and sediments from cropland can be prevented or reduced by ensuring the proper use and application of chemicals, encouraging the infiltration of water and discouraging runoff, and minimizing soil disturbance.

Sources of pollution from animal feeding operations include facilities that are treated as both point and nonpoint sources. Animal waste from these operations can introduce pathogens, nutrients (phosphorus and nitrogen), and organic matter to nearby rivers and streams. Pollution from animal facilities can be prevented through the proper siting and management of the operation. Many facilities implement a comprehensive plan for handling, storing, and using all wastes produced. For more information on animal feeding operations, see the highlight on the Unified National Strategy for Animal Feeding Operations on page 78.

Improper grazing practices on range and pasture can introduce both soil particles and animal waste into receiving streams. Implementing a comprehensive grazing management plan helps reduce contributions of pollutants by

- Maintaining sufficient soil cover
- Protecting riparian areas from trampling
- Minimizing the direct deposition of wastes into streams.

Range grazing may generate both soil erosion and animal waste runoff. Land used for pasture grazing usually has good ground cover that protects the soil from eroding, but pasture grazing can become a source of animal waste runoff if animals graze on impermeable frozen pastureland during winter.

While agriculture was the leading source associated with impaired river and stream miles, the states and tribes identified a number of other sources. The top-ranked sources are listed below:

■ Hydrologic Modifications – Hydrologic modifications (or hydromodifications) include flow regulation and modification, channelization, dredging, and construction of dams. These activities may alter a river's habitat in such a way that it becomes less suitable for aquatic life. For example, dredging may destroy the river-bottom habitat where fish lay their eggs. The states and tribes report that hydrologic modifications degrade 57,763 river and stream miles (7% of the assessed miles and 20% of the impaired miles).

■ Urban Runoff and Storm Sewers – In urban areas, runoff from impervious surfaces may include sediment, bacteria (e.g., from pet waste), toxic chemicals, and other pollutants. Development in urban areas can increase erosion that results in higher sediment loads to rivers and streams. Storm sewer systems may also release pollutants to rivers and streams, particularly during wet weather events. The states and tribes report that urban runoff and storm sewers pollute 32,310 river and stream miles (4% of the assessed miles and 11% of the impaired miles).

- Municipal Wastewater Treatment Plants (WWTPs) – Municipal WWTPs treat incoming wastewater from domestic sources and frequently wastewater inputs from industrial and commercial establishments. Although municipal WWTPs treat this waste before discharging to rivers and streams, discharges may still contain toxic chemicals, nutrients, and other pollutants. In some cases, during wet weather events, municipal WWTPs discharge untreated wastewater because of operation and maintenance problems. The states and tribes report that municipal sewage treatment plants pollute 29,087 river and stream miles (3% of the assessed miles and 10% of the impaired miles).

- Resource Extraction – Activities such as mining and oil and gas production may have adverse effects on water quality. For example, changes in the technology used for surface mining have resulted in much larger areas of land being affected by the mining operations. The runoff associated with these activities is often high in acidity and toxic metals, which can degrade rivers and streams, creating conditions that are harmful to aquatic life. Mining can continue to cause water quality impairments even after activities have ceased. The states and tribes report that resource extraction pollutes 25,231 river and stream miles (3% of the assessed miles and 9% of the impaired miles).

- Forestry Activities – Commercial forestry activities such as harvesting of trees, application of fertilizer and pesticides, and construction of logging roads may impair water quality by degrading habitat and introducing pollutants to rivers and streams. For example, tree harvesting can cause erosion that increases runoff. Trees harvested near stream courses can reduce the supply of large woody debris important in creating fish habitat in streams. Loss of riparian area timber can also reduce shade and raise water temperature. As the temperature of water increases, it can hold less dissolved oxygen, which is needed by aquatic organisms. The states and tribes report that forestry activities degrade 20,020 river and stream miles (2% of the assessed miles and 7% of the impaired miles).

- Land Disposal of Wastes – Various forms of land-based waste disposal, such as septic tanks, landfills, and application of sludge, may result in the runoff of pollutants to rivers and streams. These pollutants can include bacteria, hazardous wastes, organic materials, and sediment. The states and tribes report that land disposal of wastes pollutes 19,928 river and stream miles (2% of the assessed miles and 7% of the impaired miles).

- Habitat Modifications – Changes to a river's habitat, such as removal of riparian vegetation, riverbank modification, and drainage and filling of wetlands, can make it less suitable for the organisms inhabiting it, create conditions favorable to invasion by species not present prior to the changes, or limit its ecosystem function. The states and tribes report that habitat modifications degrade 18,451 river and stream miles (2% of the assessed miles and 6% of the impaired miles).

The states and tribes also report that "natural" sources impair over 33,000 miles of rivers and streams. Natural sources include soils with natural deposits of arsenic or salts that leach into waterbodies, waterfowl (a source of nutrients), and drought, which causes low-flow conditions and elevated water temperatures.

Sources such as mining and forestry activities can play a more significant role in degrading water quality at a regional or local level than at the national level. For example, resource extraction (including acid mine drainage) contributes to the degradation of 43% of the impaired river and stream miles in the coal belt states of Kentucky, Maryland, Ohio, Pennsylvania, and West Virginia. These states report that resource extraction impairs about 5,800 miles of rivers and streams. Yet, at the national level, resource extraction contributes to the degradation of only 9% of all the impaired river and stream miles in the nation. At the local level, streams impacted by acid mine drainage are devoid of fish and other aquatic life due to low pH levels and the smothering effects of iron and other metals deposited on stream beds. The primary sources of acid mine drainage are abandoned coal refuse disposal sites and surface and underground mines.

In the Pacific Northwest states of Oregon and Washington, water quality managers identify forestry activities as responsible for almost a fifth (19%) of the impaired river and stream miles, but, at the national level, states report that forestry activities contribute to the degradation of only 7% of the impaired river and stream miles identified. Forestry activities include harvesting timber, constructing logging roads, and stand maintenance. California, Mississippi, Montana, and West Virginia also report that forestry activities degrade over 1,000 miles of streams in each state.

Many states reported declines in pollution to rivers and streams from sewage treatment plants and industrial discharges since enactment of the Clean Water Act in 1972. The states attributed improvements in water quality conditions to sewage treatment plant construction and upgrades and permit controls on industrial discharges. Despite the improvements, municipal sewage treatment plants remain the fourth most common source of pollution in rivers because population growth increases the burden on our municipal facilities.

Several states reported that they detected more subtle impacts from nonpoint sources, hydrologic modifications, and habitat alterations as they reduced conspicuous pollution from point sources. Hydrologic modifications and habitat alterations are a growing concern to the states. Hydrologic modifications include activities that alter the flow of water in a stream, such as channelization, dewatering, and damming of streams. Habitat alterations include removal of streamside vegetation that protects the stream from high temperatures and scouring of stream bottoms. Additional gains in water quality conditions that address these concerns will be more subtle and require innovative management strategies.

Through the Eyes of Morning

The long
complicated
elements of morning
drape themselves across the dew touched meadow
as if they are
lace
from the intricate garments of a queen
who has chosen
this moment
to blow a frosty kiss to her people through the fog–
so intensely ghost white
that if you look deep enough
you can see yourself.
And so I look.
Deep.
Hoping that if something as simple
yet intense,
as young
yet ancient,
as morning
knows who I am, maybe I will too.

But I only see the dew.
And the fog.

And who is anyone
through the distorted eyes of
morning?

River of Words 1999 Grand Prize Winner (Poetry, Grades 7-9)
Anne Atwell-McLeod, Age 13, ME

River of Words 1999 Grand Prize Winner (Art, Grades 7-9)
Naomi Celmo, *Wild and Free - The River and Me*, Age 15, FL

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Restoring the Mississippi River Ecosystem

The Mississippi River and the basin it sustains are an integral part of the history, culture, economy, and environment of the United States. The main stem of the river and its tributaries drain 40% of the land in the lower 48 states. This area includes parts of 26 states and parts of 6 of the 10 EPA Regions and is home to almost a third of the U.S. population (see figure below). The river is an extremely important resource. It is a drinking water supply for tens of millions of people, it transports barges bearing billions of dollars worth of cargo, and, together with its remaining wetlands, it is habitat to large and valuable populations of waterfowl, fish, and shellfish. In addition, billions of dollars are spent on recreation associated with the river.

Figure 1. The Mississippi River Basin System

In recent years, there has been growing concern about water quality in the Mississippi River and the Gulf of Mexico into which it drains. In response, EPA and other concerned agencies have launched programs to restore water quality. The Mississippi River Initiative addresses point source pollution, while a nutrient task force and basin teams work to control nonpoint sources in the Mississippi River Basin.

Condition of the Resource

Activities on the land that constitute the Mississippi River's huge watershed affect the quality of the river and the Gulf of Mexico. The river receives runoff laden with fertilizers and other chemicals and direct discharges of treated wastewater from cities and factories. The engineering that has been undertaken to control floods and enhance navigation has taken a toll as well. Separating the river channel from the floodplain through flood control and land use conversion measures has reduced the ability of the river to cleanse itself of nutrients and has starved the marshes of Louisiana of sediment needed to offset subsidence and sea-level rise.

Compounding these problems, the Gulf of Mexico, which is strongly correlated with nutrient discharges from the mouth of the Mississippi River, is suffering from hypoxia. Hypoxia is an absence of oxygen reaching living tissues. In coastal waters, it is characterized by levels of dissolved oxygen so low that not enough is available to support fish and other aquatic species. Eutrophication or the overabundance of nutrients, such as nitrogen and phosphorus, causes hypoxia. Excess nutrients may come from a wide range of sources: runoff from developed land, atmospheric deposition, soil erosion, and agricultural fertilizers. Sewage and industrial discharges also contribute nutrients.

The Mississippi River Initiative

The Mississippi River Initiative began as a way to address the unprecedented amount of pollution currently contaminating the river. In September 1997, representatives from affected U.S. Attorneys' offices met in St. Louis for 2 days with officials from the Justice Department to discuss the state of the river and how best to work together to stop point source pollution and clean up the river. The Initiative has developed into a comprehensive, coordinated federal effort to keep illegal pollution, ranging from raw sewage to industrial waste, out of the river and to restore the river and surrounding communities to their historic grandeur. To stop illegal point source pollution from entering the river, the Initiative employs the cooperative efforts of the Department of Justice, EPA's civil and criminal enforcement groups, the U.S. Customs Service, other U.S. Attorneys, the U.S. Coast Guard, the U.S. Fish and Wildlife Service, state attorneys general, state environmental agencies, the Federal Bureau of Investigation, and other state and local leaders.

Mississippi River/Gulf of Mexico Watershed Nutrient Task Force

EPA, together with representatives from federal, state, and tribal agencies and organizations, formed the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force during the fall of 1997. The Task Force was established to study the causes and effects of excessive nutrient runoff to the Mississippi River Basin and to coordinate and implement nutrient reduction activities to alleviate hypoxia in the Gulf of Mexico. To date, the Task Force has initiated a two-track effort to respond to the nutrients issue. The first is an ecosystem/watershed management track to develop and implement nutrient reduction strategies in the basin. The second track is to assess the state of scientific knowledge and understanding of hypoxia.

Task Force activities include coordinating and supporting nutrient management activities from all sources, restoring habitats to trap and assimilate nutrients, and supporting other hypoxia-related activities in the Mississippi River and Gulf of Mexico watersheds.

The Mississippi River Basin System Teams

In December 1997, EPA representatives from the Gulf of Mexico program, Office of Water, and EPA Regions of the Mississippi River Basin met in St. Louis to review the issues and needs in the Basin. One outcome of this meeting was the creation of EPA teams for each major segment or tributary system of the Mississippi River. The following teams were organized:

- Missouri River Tributary Team
- Upper Mississippi Segment Team
- Arkansas-Red-White River
- Tennessee River Tributary Team
- Ohio River Tributary Team
- Lower Mississippi River Segment Team.

The purpose of the teams is to build upon and complement the work of state, tribal, regional, and local efforts to address the public health and environmental issues in the Mississippi River Basin. In particular, the teams work to enhance

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EPA's support for a number of existing multistate, multistakeholder organizations and efforts. These include the Upper Mississippi River Basin Association (UMRBA), the Ohio River Valley Sanitation Commission (ORSANCO), the Corps of Engineers' Environmental Management Program for the Upper Mississippi River, and the state of Illinois' Illinois River Initiative.

River of Words 1999 Finalist, Jennifer Strand, Age 14, *Breezy Night*, PA

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Unified National Strategy for Animal Feeding Operations (AFO) (March 9, 1999)

The USDA-EPA Unified National Strategy for AFOs was one of more than 100 actions President Clinton requested in the Administrator's Clean Water Action Plan. Animal feeding operations, or AFOs, are livestock-raising operations, such as hog, cattle, dairy, and poultry farms, where animals are kept and raised in confined situations. When not properly managed, animal waste from these operations can run off into nearby waterbodies. Since the 1970s, factors such as the growing concentration of animals at larger feeding operations, the availability of new waste and runoff controls, and increasing water pollution problems have heightened awareness that more should be done to control agricultural waste.

The AFO strategy addresses the water quality problems resulting from ineffective waste management. These problems include runoff polluted by excess nitrogen, phosphorus, pathogens, and other compounds. Elevated concentrations of these pollutants have been associated with the contamination of drinking water, crops, and animal feed and adverse impacts to fish and shellfish.

The draft strategy proposes a variety of voluntary and regulatory approaches. It is designed to help AFO owners and operators remain financially strong while reducing threats to public health and water quality. This draft strategy contains a section encouraging industry leadership to provide education, financing, and advice for pollution control plans. The strategy establishes an expectation that all animal feeding operations develop and implement comprehensive nutrient management plans by the year 2009. These plans include manure handling and storage, application of manure to the land, recordkeeping, feed management, integration with other conservation measures, and other manure utilization options.

As part of the strategy, USDA and EPA estimate that 95% of the 450,000 animal feeding operations will implement voluntary comprehensive nutrient management plans. An estimated 15,000 to 20,000 livestock operations will be required to develop comprehensive nutrient management plans as part of permits under the Clean Water Act.

To date, approximately 2,000 permits have been issued to concentrated animal feeding operations under the authority of the Clean Water Act. The EPA program intends to focus permitting and

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enforcement activities on three types of facilities:

- The largest concentrated AFOs (or CAFOs, those with 1,000 or more animal units [1 animal unit = 1 steer weighing 1,000 pounds])
- AFOs with unacceptable conditions such as direct discharge into waterways
- AFOs that are significant contributors to water quality impairment within a watershed.

Earl Scales, Weirsdale, FL

John H. McShane, Mt. Rainier National Park, WA

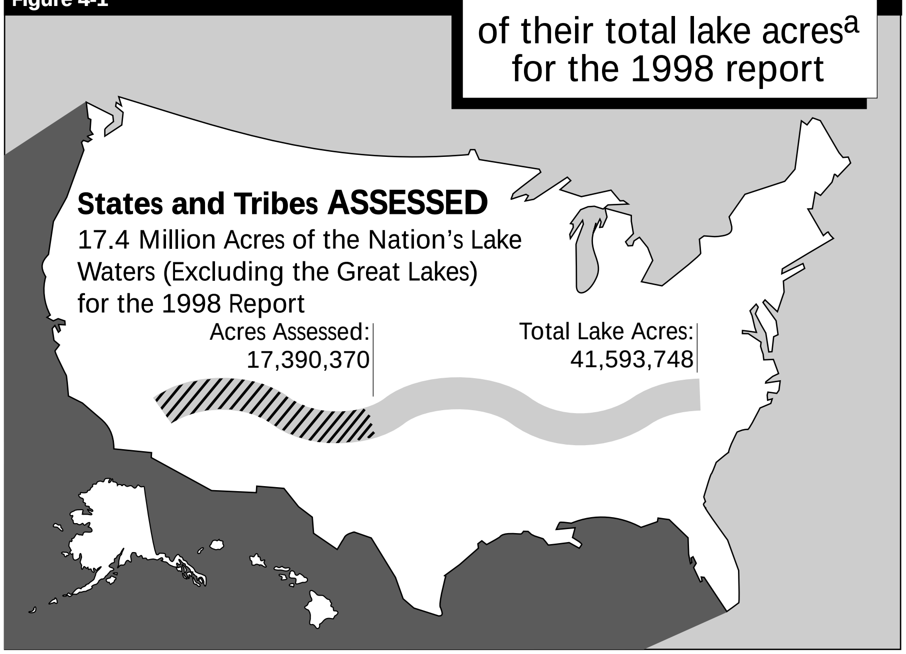
Lakes, Reservoirs, and Ponds

Forty-five states, Puerto Rico, and the District of Columbia (collectively referred to as states in the rest of this chapter) and two tribes rated lake water quality in their 1998 Section 305(b) reports (see Appendix B, Table B-1, for individual state and tribal data). These states and tribes assessed nearly 17.4 million acres of lakes, reservoirs, and ponds, which equals 42% of the 41.6 million acres of lakes in the nation (Figure 4-1). The states and tribes based 65% of their assessments on monitored data and evaluated 17% of the assessed lake acres with qualitative information. The states did not specify whether the remaining 18% of the assessed lake acres were monitored or evaluated.[a]

The number of assessed lake acres increased from 16.8 million acres to 17.4 million acres, a 3% increase from 1996 to 1998. This increase is due to greater monitoring coverage from a number of states including Arizona, Massachusetts, Montana, and Nevada. Wisconsin increased its assessed

States and Tribes ASSESSED 42% of their total lake acres[a] for the 1998 report

Figure 4-1



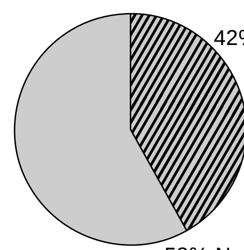
This figure compares the total acres of lakes, reservoirs, and ponds with the subset that were assessed by states for the 1998 water quality report.

Based on data contained in Appendix B, Table B-1.

THE STATES ASSESSED over 17 million acres of lakes for 1998.

Lake, Reservoir, and Pond Acres Assessed by the States and Tribes

1998 17,390,370 acres = 42% assessed
Total acres: 41,593,748[a]



1996 16,819,769 acres = 40% assessed
Total acres: 41,684,902[b]

1994 17,134,153 acres = 42% assessed
Total acres: 40,826,064[c]

1992 18,300,000 acres = 46% assessed
Total acres: 39,920,000[d]

[a]Source: 1998 state and tribal section 305(b) reports.
[b]Source: 1996 state and tribal section 305(b) reports.
[c]Source: 1994 state and tribal section 305(b) reports.
[d]Source: 1992 state and tribal section 305(b) reports.

Note: Figures do not add to 100% due to the rounding of individual numbers.

55% OF ASSESSED lake acres have good water quality.

lake acreage by using volunteer monitoring data.

These increases more than offset significant decreases in reported lake acres from a number of other states.

The states and tribes used recent monitoring data to assess 65% of their assessed lake acres (see Appendix B, Table B-2, for individual state and tribal information). Evaluated assessments, based on qualitative information or monitoring information more than 5 years old, were used for 17% of the assessed lake acres. States did not specify whether the remaining 18% of assessed lake acres were monitored or evaluated. Compared to the 1996 reporting cycle, states are using monitoring data for a smaller percentage of their assessments. In 1996, states used monitoring data in 74% of their lake assessments.

Differences among state assessment methods limit meaningful comparisons of lake information submitted by individual states. States devote varying resources to monitoring biological integrity, water chemistry, and toxic pollutants in fish tissues. The wide range in water quality rating reported by the states reflects both differences in water quality monitoring and differences in assessment methods.

The summary information presented in this chapter applies strictly to the portion of the nation's lakes assessed by the states and tribes. EPA cannot make generalizations about the health of all of our nation's lakes based on data extracted from the 305(b) reports. The primary reason the assessment data cannot be used to make general statements about national water quality is that states have not achieved comprehensive assessment of all lakes. Another factor is the monitoring design used to collect data. Many states and tribes direct their limited monitoring resources toward waters with suspected problems. As a result, the assessed lakes probably contain a higher percentage of polluted waters than all of the nation's lakes. A risk of this targeted monitoring approach is that healthy waters may deteriorate without anyone noticing.

Water Quality Assessment

States and tribes rate water quality by comparing data to standards. Water quality standards include narrative and numeric criteria that support specific designated uses. Standards also specify goals to prevent degradation of good quality waters.

States and tribes use their numeric and narrative criteria to evaluate whether the designated uses assigned to the waterbodies are supported. Designated uses reflect the goals of the Clean Water Act. They aim to protect human health and the biological integrity of aquatic ecosystems. The most common designated uses are:

- Aquatic life support
- Drinking water supply
- Recreation such as swimming, fishing, and boating
- Fish consumption.

After comparing water quality data to standards, states and tribes classify the waters into the following categories:

■ **Good/Fully Supporting:** Good water quality supports a diverse community of fish, plants, and aquatic insects, as well as the array of human activities assigned to a lake by the state. These waters meet applicable water quality standards, both criteria and designated use.

■ **Good/Threatened:** Good water quality currently supports aquatic life and human activities in and on the lake. These waters are currently meeting water quality standards, but states and tribes are concerned they may degrade in the near future. These concerns are based on a trend of increasing pollution or land use changes that may threaten future water quality.

■ **Fair/Partially Supporting:** Fair water quality supports aquatic communities with fewer species of fish, plants, and aquatic insects and/or pollution occasionally interferes with human activities. These waters are meeting water quality standards most of the time, but exhibit occasional exceedances. For example, runoff during severe thunderstorms may temporarily elevate fecal coliform bacteria densities and indicate that swimming is not safe immediately following summer storms.

■ **Poor/Not Supporting:** Poor water quality does not support a healthy aquatic community and/or prevents some human activities on the lake. These waters are not meeting water quality standards. For example, lake waters may be devoid of fish for more than a month each summer because excessive nutrients from runoff initiate algal blooms that deplete oxygen concentrations.

■ **Not Attainable:** The state has performed a use-attainability analysis and demonstrated that support of one or more designated beneficial uses is not attainable due to specific biological, chemical, physical, or economic/social conditions (see Chapter 1 for additional information).

Summary of Use Support

Most states and tribes rate how well a lake supports individual uses (such as swimming and aquatic life) and then consolidate individual use ratings into a summary table. This table divides assessed lake acres into those that are

■ **Good** – Fully supporting all of their uses or fully supporting all uses but threatened for one or more uses

■ **Impaired** – Partially or not supporting one or more uses

■ **Not attainable** – Not able to support one or more uses.

Forty-four states, two tribes, Puerto Rico, and the District of Columbia reported summary use support status for lakes in their 1998 Section 305(b) reports (see Appendix B, Table B-2, for individual state and tribal information). Montana reported individual use support status but did not report summary use support status. In this case, EPA used aquatic life use support status to summarize water

45% OF ASSESSED lake acres are impaired for one or more uses

Assessed Waters

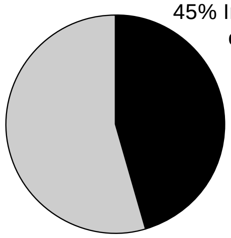
Total lakes = 41,593,748 acres[a]
Total assessed = 17,390,370 acres[b]

■ 42% assessed
■ 58% not assessed

Of the assessed acres:

- 65% were monitored
- 17% were evaluated
- 18% were not specified

Assessed Water Quality



[a]Source: 1998 state and tribal Section 305(b) reports.

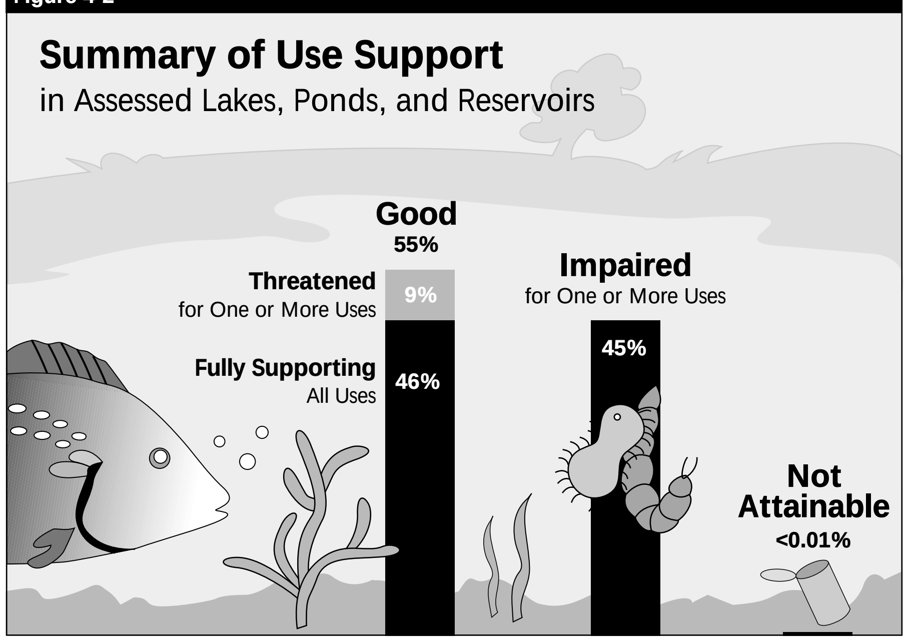
quality conditions in Montana's lakes.

It is important to note that seven states did not include the effects of statewide fish consumption advisories for mercury when calculating their summary use support status in lakes. Connecticut, Massachusetts, Michigan, New Hampshire, New Jersey, North Carolina, and Vermont excluded the impairment associated with statewide mercury advisories in order to convey information that would have been otherwise masked by the fish consumption advisories. If these advisories had been included, all of the states' lakes would have received an impaired rating. (See discussion of mercury in "Pollutants and Stressors Impacting Lakes, Reservoirs, and Ponds" on page 86.)

New York also excluded the effects of a statewide PCB/chlordane/mirex/DDT fish consumption advisory for lakes in its summary data.

The states and tribes reported that 55% of their assessed 17.4 million lake acres have good water quality (Figure 4-2). Waters with good quality include 46% of the assessed lake acres that fully support all uses and 9% of the assessed lake acres that fully support all uses but are threatened for one or more uses. Some form of pollution or habitat degradation impairs the remaining 45% of the assessed lake acres.

Figure 4-2



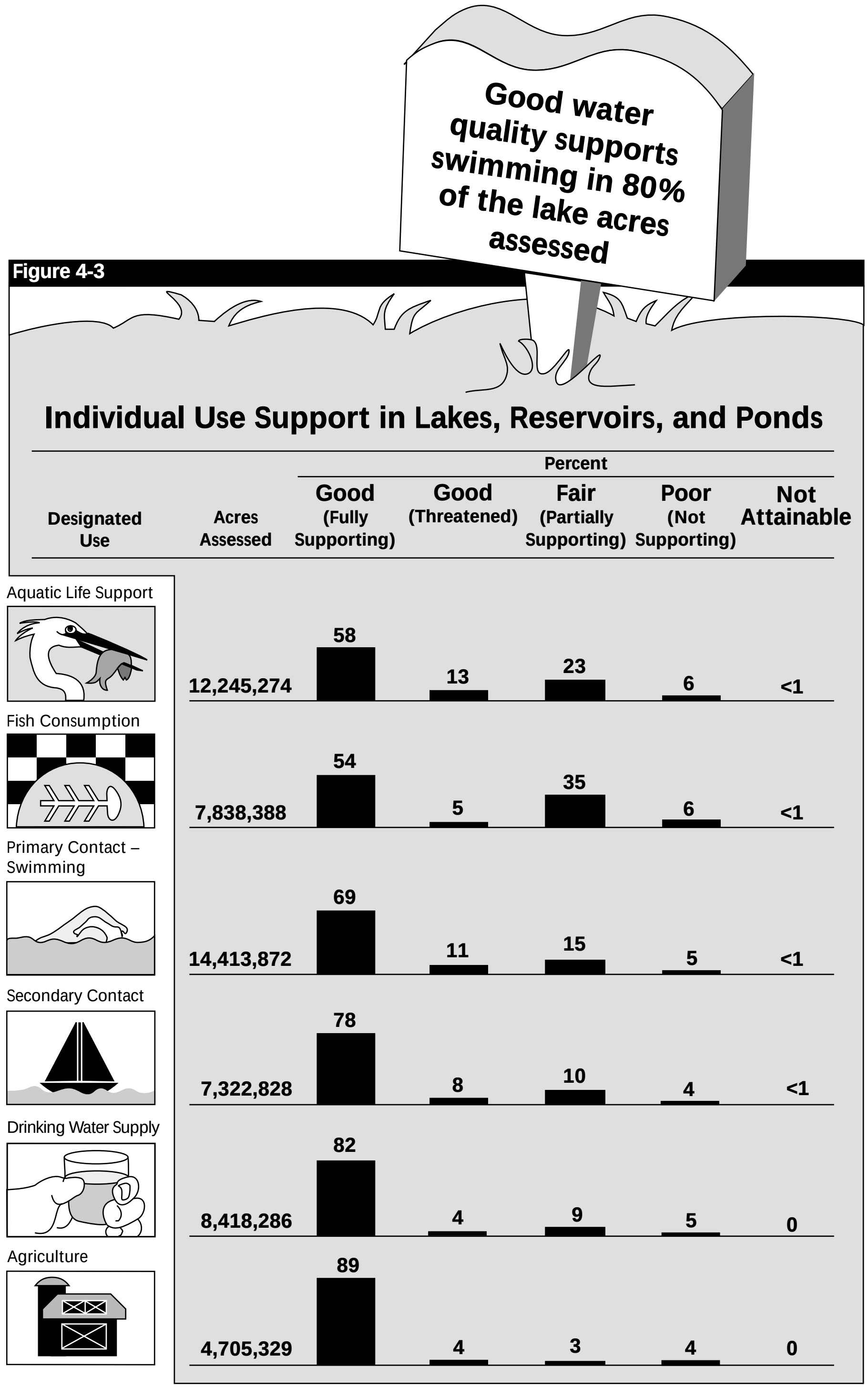
This figure presents the status of the assessed acres of lakes, reservoirs, and ponds. Of the more than 17 million acres of lakes, reservoirs, and ponds assessed, 55% fully support their designated uses and 45% are impaired for one or more uses. Nine percent of the assessed waters are fully supporting uses but threatened.

Based on data contained in Appendix B, Table B-2.

Individual Use Support

Individual use support assessment provides important details about the nature of water quality problems in our nation's surface waters. The states establish specific designated uses for waterbodies through their water quality standards. The states consolidate their more detailed uses into six general use categories so that EPA can present a summary of the state and tribal data. The standard uses consist of aquatic life support, fish consumption, primary contact recreation (such as swimming and diving), secondary contact recreation (such as boating), drinking water supply, and agricultural use.

Forty-two states, one tribe, Puerto Rico, and the District of Columbia reported individual use support status of their lakes, reservoirs, and ponds (see Appendix B, Table B-3, for individual state and tribal information). The reporting states and tribe assessed aquatic life use and swimming use most frequently. They identified more impacts on aquatic life use and swimming use than the other individual uses (Figure 4-3). These states and tribes reported that fair or poor water quality impacts aquatic life in over 3.5 million lake acres (29% of the 12.2 million acres assessed for aquatic life support), and swimming criteria violations impact 2.8 million lake acres (20% of the 14.4 million acres assessed for swimming use support).



This figure presents a tally of the acres of lakes, reservoirs, and ponds assessed by states for each category of designated use. For each category, the figure presents a summary of the proportion of the assessed waters rated according to quality.

Based on data contained in Appendix B, Table B-3.

Many states did not rate fish consumption use support because they have not included fish consumption as a use in their standards. However, through separate tracking of state fish consumption advisories, EPA estimates that about 6.5 million lake acres were under advisories in 1998. EPA encourages the states to designate fish consumption as a separate use in their waterbodies to promote consistency in future reporting.

Water Quality Problems Identified in Lakes, Reservoirs, and Ponds

When states and tribes rate waters as impaired, they also attempt to identify the causes and sources of impairment. Figures 4-4 and 4-5 identify the pollutants and sources of pollutants that impair the most acres of assessed lakes.

The following sections describe the leading pollutants/stressors and sources of impairment identified in lakes. It is important to note that the information about pollutants/stressors and sources is incomplete. The states and tribes do not always report the pollutants/stressors or source of pollutants impacting every impaired lake. In some cases, they may recognize that water quality does not fully support a designated use, but may not have adequate data to document the specific pollutant or stressor responsible for the impairment. Sources are even more difficult to identify than pollutants and stressors.

In addition, eight states did not include the effects of statewide lake fish consumption advisories when reporting the pollutants and sources responsible for impairment. As a result, the pollutants associated with the advisories (mercury for seven states and PCBs/chlordane/mirex/DDT for one state) are significantly underrepresented by the values presented in this report. Similarly, the sources associated with these pollutants, often atmospheric deposition or contaminated sediments, are underrepresented.

Pollutants and Stressors Impacting Lakes, Reservoirs, and Ponds

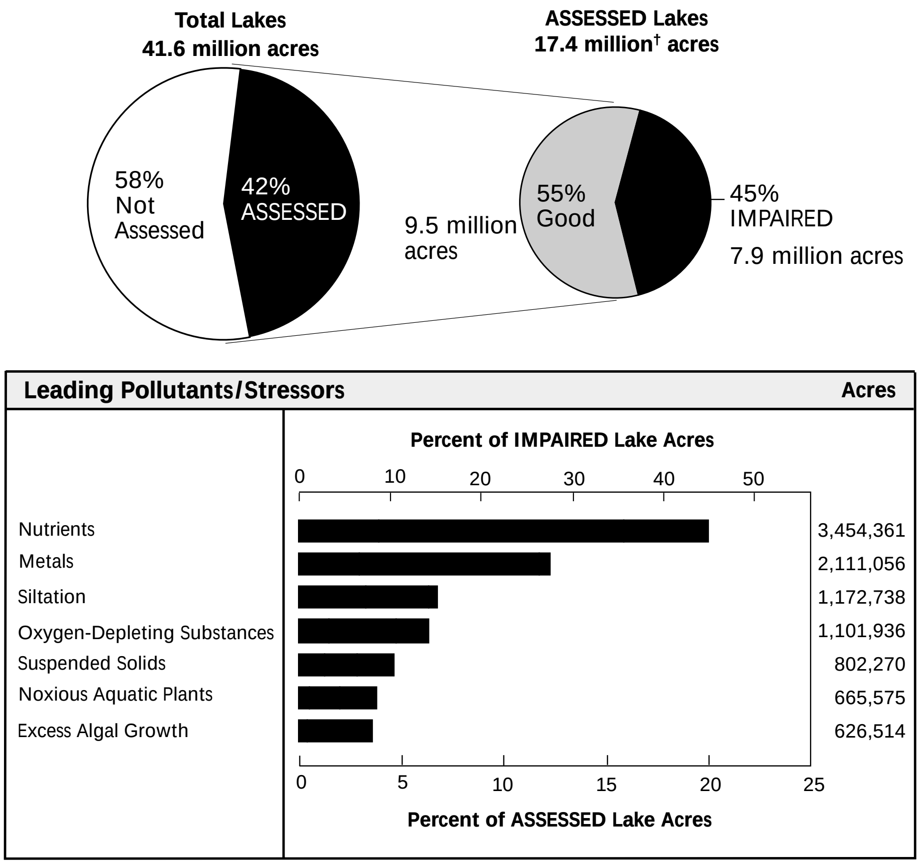
Forty-six states and tribes reported the number of lake acres impacted by individual pollutants and stressors, such as invasive aquatic plants (see Appendix B, Table B-4, for individual state and tribal information).

The states, tribe, District of Columbia, and Puerto Rico identified more lake acres polluted by nutrients than any other pollutant or stressor (Figure 4-4). They reported that excess nutrients pollute 3.5 million lake acres (which equals 20% of the assessed lake acres and 44% of the impaired lake acres).

Healthy lake ecosystems contain nutrients in small quantities from natural sources. Extra inputs of nutrients (primarily nitrogen and phosphorus) disrupt the balance

Figure 4-4

Leading POLLUTANTS in Impaired Lakes*



States assessed 42% of the total acres of lakes, reservoirs, and ponds for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 55% are rated as good and 45% as impaired. When states identify waters that are impaired, they describe the pollutants or processes causing or contributing to the impairment. The bar chart presents the leading causes and the number of lake, reservoir, and pond acres impacted. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these pollutants. The lower axis compares the acres impacted by the pollutant to the total ASSESSED acres. The upper axis compares the acres impacted by the pollutant to the total IMPAIRED acres.

Based on data contained in Appendix B, Table B-4.

* Eight states did not include the effects of statewide fish consumption advisories when reporting the pollutants and sources responsible for impairment. Therefore, certain pollutants and sources, such as metals and atmospheric deposition, may be underrepresented.

† Includes acres assessed as not attainable.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a lake.

The pollutants/processes and sources shown here may not correspond directly to one another (i.e., the leading pollutant may not originate from the leading source). This may occur because a major pollutant may be released from many minor sources. It also happens when states do not have the information to determine all the sources of a particular pollutant/stressor.

According to the states, **NUTRIENTS** are the most common pollutants affecting assessed lakes. Nutrients

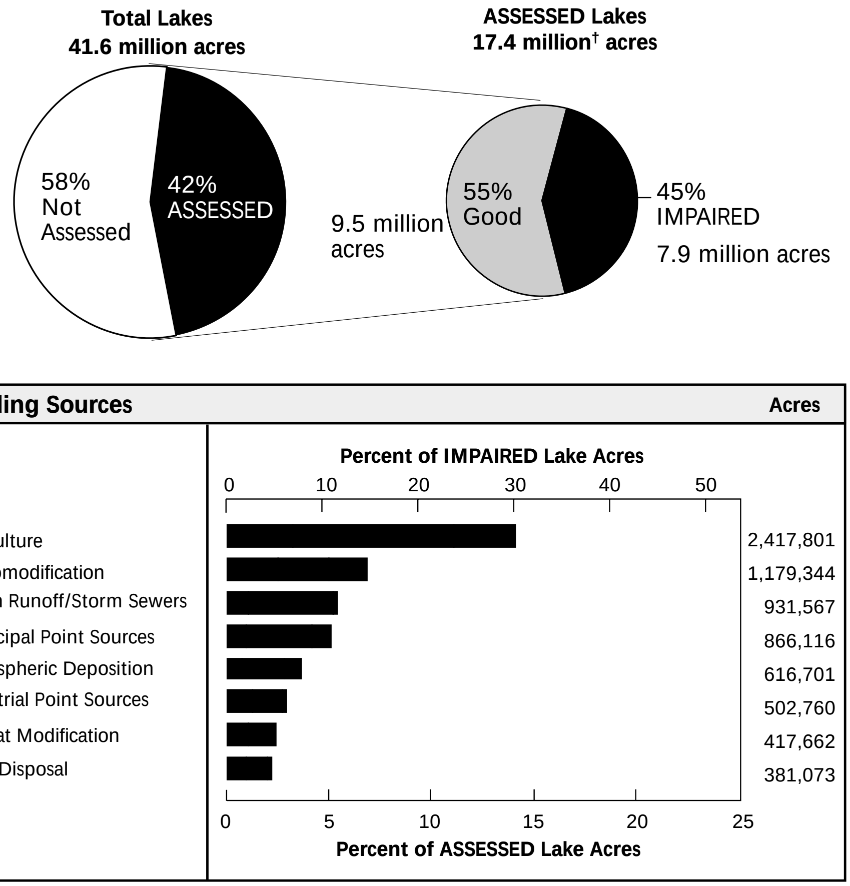
- Are found in 20% of the assessed lakes (see Figure 4-4)
- Contribute to 44% of reported water quality problems in impaired lakes.

According to the states, **AGRICULTURE** is the leading source of pollution in assessed lakes. Agricultural pollution problems

- Affect 14% of the assessed lakes
- Contribute to 31% of reported water quality in impaired lakes (see Figure 4-5).

Figure 4-5

Leading SOURCES of Lake Impairment*‡



States assessed 42% of the total acres of lakes, reservoirs, and ponds for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 55% are rated as good and 45% as impaired. When states identify waters that are impaired, they also describe the sources of pollutants associated with the impairment. The bar chart presents the leading sources and the number of lake, reservoir, and pond acres impacted. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these sources. The lower axis compares the acres impacted by the source to the total ASSESSED acres. The upper axis compares the acres impacted by the source to the total IMPAIRED acres.

Based on data contained in Appendix B, Table B-5.

* Eight states did not include the effects of statewide fish consumption advisories when reporting the pollutants and sources responsible for impairment. Therefore, certain pollutants and sources, such as metals and atmospheric deposition, may be underrepresented.

† Includes acres assessed as not attainable.

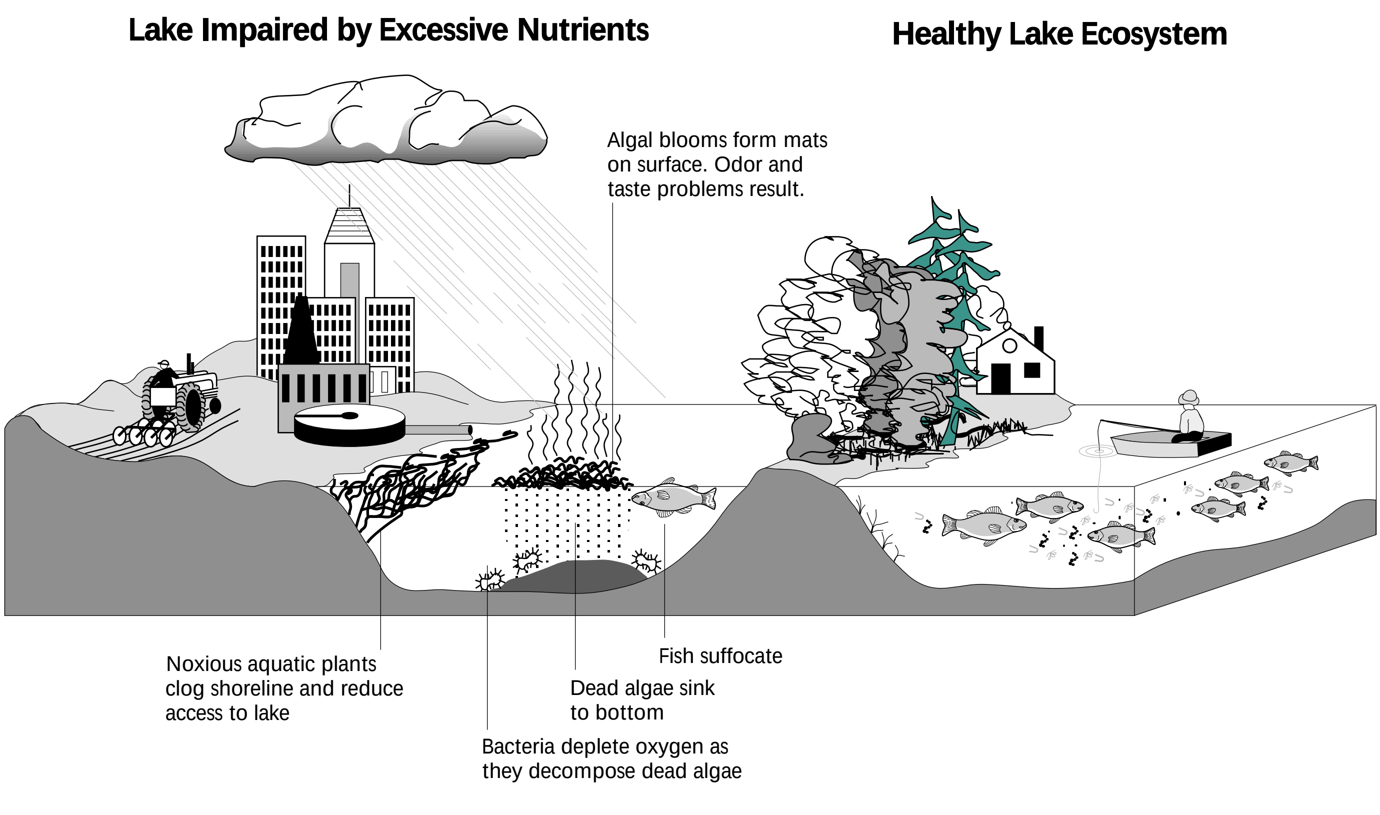
‡ Excluding unknown, natural, and "other" sources.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a lake.

of lake ecosystems (Figure 4-6). Excessive nutrients stimulate population explosions of undesirable algae and aquatic weeds. The algae sink to the lake bottom after they die, where bacteria decompose them. The bacteria consume dissolved oxygen in the water while decomposing the dead algae. This, in turn, deprives fish and other organisms of oxygen. Fish kills and foul odors may result if dissolved oxygen is depleted.

After nutrients, the states reported metals as the second most common pollutant in assessed lake acres, impairing 2.1 million lake acres (12% of the assessed lake acres and 27% of impaired lake acres). States consistently report metals as a major cause of impairment to lakes. This is mainly due to the widespread detection of mercury in fish tissue samples. It is difficult to measure mercury in ambient water. Most states rely on fish tissue samples to indicate mercury contamination, since mercury bioaccumulates in tissue. States are actively studying the extent of the mercury problem, which is complex because it involves atmospheric transport from power-generating facilities, waste incinerators, and other sources.

Figure 4-6



Nutrients cause nuisance overgrowth of algae as well as noxious aquatic plants, which leads to oxygen depletion via plant respiration and microbial decomposition of plant matter. If not properly managed and controlled, sources such as agriculture, industrial activities, municipal sewage, and atmospheric deposition can contribute to excessive nutrients in lakes.

In addition to nutrients and metals, the states report that siltation pollutes 1.2 million lake acres (7% of the assessed lake acres and 15% of the impaired lake acres), enrichment by organic wastes that deplete dissolved oxygen in lake waters impacts 1.1 million lake acres (6% of the assessed lake acres and 14% of the impaired lake acres), and suspended solids impact 802,270 acres (5% of the assessed lake acres and 10% of the impaired lake acres). While siltation generally refers to the deposition of sediment in the bottom of a waterbody, suspended solids hang in the water column.

Often, several pollutants and processes impact a single lake. For example, an activity such as removal of shoreline vegetation may accelerate erosion of sediment and nutrients into a lake. In such cases, the states and tribes count a single lake acre under each pollutant and process category that impacts the lake acre. Therefore, the lake acres impaired by each pollutant and process do not add up to 100% in Figures 4-4 and 4-5.

This presentation ranks pollutants and stressors by the geographic extent of their impacts (i.e., the number of lake acres impaired by each pollutant or stressor). However, less abundant pollutants or stressors may have more severe impacts than the leading pollutants listed above. For example, extreme acidity (also known as low pH) can eliminate fish in isolated lakes, but acid impacts on lakes are concentrated in northeastern lakes and mining states and are not widespread across the country as a whole. The individual state 305(b) reports provide more detailed information about the severity of pollution in specific locations.

Sources of Pollutants Impacting Lakes, Reservoirs, and Ponds

Forty-five states and tribes reported sources of pollution related to human activities that impact some of their lakes,

Trophic States

Oligotrophic	Clear waters with little organic matter or sediment and minimum biological activity.
Mesotrophic	Waters with more nutrients and, therefore, more biological productivity.
Eutrophic	Waters extremely rich in nutrients, with high biological productivity. Some species may be choked out.
Hypereutrophic	Murky, highly productive waters, closest to the wetlands status. Many clearwater species cannot survive.
Dystrophic	Low in nutrients, highly colored with dissolved humic organic matter. (Not necessarily a part of the natural trophic progression.)

In 1998, 32 states reported that 17% of the 7,373 lakes they assessed for trophic status were oligotrophic, 33% were mesotrophic, 38% were eutrophic, 12% were hypereutrophic, and less than 1% were dystrophic.

The Eutrophication Process

Eutrophication is a natural process, but human activities can accelerate eutrophication by increasing the rate at which nutrients and organic substances enter lakes from their surrounding watersheds. Agricultural runoff, urban runoff, leaking septic systems, sewage discharges, eroded streambanks, and similar sources can enhance the flow of nutrients and organic substances into lakes. These substances can overstimulate the growth of algae and aquatic plants, creating conditions that interfere with the recreational use of lakes and the health and diversity of native fish, plant, and animal populations. Enhanced eutrophication from nutrient enrichment due to human activities is one of the leading problems facing our nation's lakes and reservoirs.

reservoirs, and ponds (see Appendix B, Table B-5, for individual state information). The states reported that agriculture is the most widespread source of pollution in the nation's assessed lakes (Figure 4-5). Agriculture generates pollutants that degrade aquatic life or interfere with public use of 2.4 million lake acres (14% of the assessed lake acres and 31% of the impaired lake acres).

Of the 35 states and tribes that reported impairment from agriculture, 16 reported the number of lake acres impacted by specific types of agricultural activities:

- Nonirrigated Crop Production – crop production that relies on rain as the sole source of water.
- Irrigated Crop Production – crop production that uses irrigation systems to supplement rainwater.
- Specialty Crop Production – crop production that involves growing food items other than small grains or forage crops (e.g., avocados, cucumbers, blueberries, and cranberries) as well as ornamental plants. Specialty crops may involve more intensive production practices (e.g., fertilizer, pesticides, and irrigation).
- Range Grazing – land grazed by animals that is seldom enhanced by the application of fertilizers or pesticides, although land managers sometimes modify plant species to a limited extent.
- Pasture Grazing – land upon which a crop (such as alfalfa) is raised to feed animals, either by grazing the animals among the crops or harvesting the crops. Pasture land is actively managed to encourage selected plant species to grow, and fertilizers or pesticides may be applied more often on pasture land than range land.
- Animal Feeding Operations – either Concentrated Animal Feeding Operations (permitted, point source) or Confined Animal Feeding Operations (nonpoint source).
  - Concentrated Animal Feeding Operations (permitted, point source) – facilities in which animals are confined, fed, and maintained for some period of time throughout the year where discharges are regulated through the National Pollutant Discharge Elimination System.
  - Animal Feeding Operations (nonpoint source) – facilities in which animals are confined, fed, and maintained for some period of time throughout the year that are considered nonpoint sources according to the Clean Water Act.

The 16 states and tribes that reported the number of lake, reservoir, and pond acres impacted by specific types of agricultural activities identified the most acres impaired by range grazing. These states and tribes reported that range grazing degrades 596,452 acres (25% of the 2,417,801 acres impaired by agriculture). Following range grazing, the states and tribes report that nonirrigated crop production degrades 553,064 acres (23% of the 2,417,801 acres impaired by agriculture). The states and tribes also report that irrigated crop production degrades 410,204 acres (17% of the 2,417,801 acres

Acid Effects on Lakes

Increases in lake acidity can radically alter the community of fish and plant species in lakes and can increase the solubility of toxic substances and magnify their adverse effects. In 1998, 17 states reported that, of the 3,317 lakes assessed for acidity, 2% exhibited acidity and 17% were threatened by acidity. An additional three states did not provide the number of lakes assessed for acidity, but reported that 430 lakes exhibited acidity. Most of the states that assessed acidic conditions are located in the Northeast, upper Midwest, and the South.

Only 10 states identified sources of acidic conditions. Alabama, Colorado, Kansas, Kentucky, Maryland, Montana, Oklahoma, and Tennessee reported that acid mine drainage resulted in acidic lake conditions or threatened lakes with the potential to generate acidic conditions. Other identified sources were atmospheric deposition and natural conditions.

impaired by agriculture), pasture grazing degrades 345,011 acres (14% of the 2,417,801 acres impaired by agriculture), animal feeding operations pollute 99,936 acres (4% of the 2,417,801 acres impaired by agriculture), and specialty crop production degrades 98,165 acres (4% of the 2,417,801 acres impaired by agriculture). See Chapter 3 for a discussion of how these sources impair water quality.

After agriculture, the states reported hydrologic modifications as the second most common source of impairment in assessed lake acres, degrading 1.2 million lake acres (7% of the assessed lake acres and 15% of the impaired lake acres). Hydrologic modifications include flow regulation and modification, dredging, and construction of dams. These activities may alter a lake's habitat in such a way that it becomes less suitable for aquatic life. For example, flow regulation and modification for the purpose of flood control, drinking water supply, or hydropower can cause fluctuation in lake levels that destabilizes the shoreline habitat.

In addition, the states report that pollution from urban runoff and storm sewers degrades 931,567 lake acres (5% of the assessed lake acres and 12% of the impaired lake acres), municipal sewage treatment plants pollute 866,116 lake acres (5% of the assessed lake acres and 11% of the impaired lake acres), and atmospheric deposition of pollutants impairs 616,701 lake acres (3% of the assessed lake acres and 8% of the impaired lake acres).

As in 1996, more states reported lake degradation from atmospheric deposition than in past reporting cycles. This is due, in part, to a growing awareness of the magnitude of the atmospheric deposition problem. Researchers have found significant impacts to ecosystem and human health from atmospherically delivered pollutants.

The states listed additional sources that impact several hundred thousand lake acres, including habitat modifications, land disposal of wastes, flow regulation, resource extraction, contaminated sediments, highway maintenance and runoff, drainage and filling of wetlands, and forestry activities.

Dear Night,

I must tell you, silence
is no longer the virtue it once was, rather
it only reminds us how small and alone we
really
are. Next time you wish us to celebrate a
cosmic event, please,
be more direct. A comet, or a meteor shower,
even some good old-fashioned fireworks. The star
was a nice touch, I must admit:
more suited to the taste of poor mortals than this
awful,
divine,
stillness.

River of Words 1999 Grand Prize Winner (Poetry, Grades 10-12)
Sarah Dooley, Age 16, GA

River of Words 1998 Grand Prize Winner (Art, Grades 10-12)
Kristina Fisher, *Moon River*, Grade 12, NM

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Washington State's New Lake Nutrient Criteria

The Washington State Department of Ecology recently adopted lake nutrient criteria as part of revisions to the state's Surface Water Quality Standards. The new criteria establish a three-step approach for identifying and protecting lakes that are threatened or impacted by excess nutrients. The state plans to implement the criteria through its watershed process.

Trophic State –- a classification of the productivity of a lake ecosystem

Ecoregions – areas of relative homogeneity in ecological systems or in relationships between organisms and their environments

Why Limit Nutrients?

While nutrients such as phosphorus and nitrogen are needed for plant growth, an excess of nutrient inputs to a lake can result in unwanted amounts of plants and algae. Excess nutrients are a major cause of impairment to Washington's lakes. The nutrient criteria will serve to protect or restore lakes that are threatened or impacted by excess nutrients.

A Three-Step Approach

Washington has adopted a three-step approach to establishing lake nutrient criteria:

Step 1 – Set an action value for each ecoregion

Step 2 – Use site-specific studies for lakes exceeding the action value

Step 3 – Use trophic states to protect high-quality lakes.

The first step in the nutrient criteria process relies on total phosphorus action values established for each of the major ecoregions within the state. The action value is a total phosphorus value established at the upper limit of the trophic state in each ecoregion. Washington used EPA's *Ecoregions of the Pacific Northwest* to establish the ecoregions used in this project. Action values for nitrogen were not established because most lakes in Washington are phosphorus limited. Phosphorus limitation means that the amount of phosphorus in the lake, rather than nitrogen or both nitrogen and phosphorus, controls the growth of algae. Only a very few lakes are nitrogen limited and can be addressed through lake-specific studies.

If monitoring shows that the phosphorus level in a lake exceeds the action value, then the second step may be used to identify acceptable total phosphorus levels. The

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lake-specific study is intended to quantify existing nutrient concentrations, determine existing characteristic uses, and potential uses.

However, if monitoring data show that a lake's total phosphorus is lower than the action value, the third step may be used to help protect these higher quality lakes. For these lakes, the upper range of the applicable trophic state may be used as the proposed criteria.

Involving the Public

Public involvement is vital to the success of Washington's lake nutrient criteria program. Through the state's watershed process, members of the public propose lakes in need of nutrient criteria. These stakeholders—which include homeowner groups, lake management districts, and local governments—often coordinate the monitoring needed to determine if the lake exceeds its action value. These groups may also be involved with conducting lake-specific studies. Funding for both lake monitoring and lake-specific studies may come from Clean Water Act Section 319 grants or through the state's Centennial Clean Water Fund program.

Once the state has proposed a specific nutrient standard for a lake, the public is invited to review and comment on the proposed criteria as part of the formal process for revising and adopting water quality standards. The public is also involved during the formal adoption process. State law requires workshops, hearings, and responsiveness summaries as part of this process.

For More Information

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New Jersey Bond to Support Lake Restoration Projects

In the November 1996 general election, the citizens of New Jersey passed the *Port of New Jersey Revitalization, Dredging, Environmental Cleanup, Lake Restoration, and Delaware Bay Area Economic Development Bond Act of 1996*. This Act included $5 million for lake restoration activities at public, private, and state-owned lakes.

In January 1998, regulations were promulgated and adopted for the disbursement of the funds provided for in the Act. The state developed regulations modeled after EPA's Clean Water Act Section 314 Clean Lakes Program, and allocated funding for Phase I and Phase II type projects. New Jersey's regulations define Phase I Diagnostic-Feasibility Study as two-part studies to determine a lake's current condition and to develop possible methods for lake restoration and protection. The two parts of the study are the diagnosis of water quality conditions, including determination of pollutant loading sources, and the development of a feasible management/ restoration plan to address water quality conditions at the lake. Phase II Implementation Projects are defined as the implementation of any water quality improvement process(es) that have been recommended by a Phase I Diagnostic-Feasibility Study.

The regulations also include a prioritization methodology to award funds. One of the factors considered most in the prioritization process is public participation. Local interest and involvement are considered to be the critical element in a successful lake restoration project. Project applicants are required to solicit public comment on any projects and to encourage public involvement.

Applications were solicited and requests worth approximately $22 million were received as part of 57 applications. The New Jersey Department of Environmental Protection had originally proposed awarding the funds in two separate funding cycles. However, due to the number and amount of requests, a decision was made to award all funds ($5 million) immediately.

The appropriation process was completed in January 1999. The Department of Environmental Protection is currently preparing the associated agreements for the recipients of the funds.

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Sources of EPA Support for State Lake Protection and Restoration Projects

Support for Lake Projects Through the CWA Section 319(h) Grant Program

On July 9, 1998, EPA issued *Guidance on the Use of Clean Water Act and Safe Drinking Water Act Authorities to Address Management Needs of Lakes and Reservoirs*, which emphasized the eligibility of lake and reservoir restoration and protection activities for funding under Section 319 of the Clean Water Act (CWA) and also encouraged greater use of the CWA State Revolving Fund (CW-SRF) and the Safe Drinking Water Act (SDWA) programs to implement priority lake and reservoir management projects. This guidance referred to the earlier May 1996 Nonpoint Source Program guidance that included a separate section on "Lake Protection and Restoration Activities." This section encourages states to use Section 319 funding for "eligible activities that might have been funded in previous years under Section 314 of the Clean Water Act."

In November 1996, EPA also issued a set of *Questions and Answers on the Relationship Between the Section 319 Nonpoint Source Program and the Section 314 Clean Lakes Program*. These Questions and Answers clarified that "Phase I, II, and III projects, and lake water quality assessments which were previously done under the Section 314 Clean Lakes Program are eligible for funding under Section 319(h) grants." However, the Section 319 guidance stresses that "(l)ake protection and restoration activities are eligible for funding under Section 319(h) to the same extent, and subject to the same criteria, as activities to protect and restore other types of waterbodies from nonpoint source pollution." There are several key criteria that lakes-related work needs to meet to be eligible for funding under Section 319:

- The activity must be included in a state nonpoint source management program. Thus, state lake managers and lake communities will need to ensure that critical lake nonpoint source control needs are included in any updated state nonpoint source management programs.

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■ States may use Section 319 funds to update state nonpoint source management programs and nonpoint source assessments, including Phase I Clean Lakes Diagnostic-Feasibility Studies and statewide lake water quality assessments, subject to the following limitation: The guidance provides that states may use up to 20% of their Section 319(h) funds to update and refine their programs and assessments.

EPA Regional Clean Lakes Coordinators, EPA Regional Nonpoint Source Coordinators, and their counterparts at the state/local level are working together to ensure that critical lake nonpoint source management needs are addressed through Section 319. Key actions include ensuring that lake management needs are included in updated state nonpoint source management programs so that these activities are grant eligible and ensuring that high-priority lake management activities are included in annual work programs for Section 319(h) grants.

Support for Lake Projects Through the Clean Water State Revolving Fund

EPA has also been encouraging greater use of the CW-SRF to address nonpoint source problems.

In creating the CW-SRF, Congress provided broad eligibility; states can fund virtually any type of water quality project, including nonpoint source, wetlands, estuary and other types of watershed projects, as well as the more traditional municipal wastewater treatment systems. Lake managers can seek funding for projects under the CW-SRF as long as the problem is identified in state nonpoint source management programs. So, lake managers will want to make sure that priority lake management needs are identified in the updated state nonpoint source management programs.

The CW-SRFs have in excess of $27 billion in assets and since 1988 have funded more than $900 million in nonpoint source projects. EPA has established a goal of moving 10% of the Revolving Fund disbursements to nonpoint source projects. Thus, in addition to the funds available under the Section 319 Nonpoint Source Program, an enormous potential exists for using the CW-SRF to fund lake and reservoir restoration and protection projects as well as projects for other waterbody types.

Support for Lake Projects Through Safe Drinking Water Act Initiatives

The Safe Drinking Water Act Amendments of 1996 include new provisions that can be used to help protect and restore lakes and reservoirs that are sources of drinking water.

Under the Amendments, EPA issued guidance for State Source Water Assessment and Protection Programs in August 1997 and, as of summer 1999, most states have submitted their programs for EPA review and approval. Also, many states have already started to undertake source water assessments for a number of public water supplies, many of which draw water from lakes or reservoirs. These assessments will help identify local needs for protection and/or restoration activities, and these activities can be funded by a variety of sources, including the Section 319 Nonpoint Source Program; the Drinking Water State Revolving Fund created by the 1996 Amendments to the Safe Drinking Water Act, which can make loans and grants for source water protection; and the separate Clean Water State Revolving Funds.

EPA anticipates that many of the principles developed as part of the existing Wellhead Protection Program for ground water systems will be applicable to surface water systems. Among other options, states may design source water protection programs that build on wellhead components such as source water area delineation, contaminant source inventories, management measures, and contingency planning. Approaches for lake assessment and diagnostic techniques developed under the Clean Water Act should also provide models.

Developing a new water supply can be very expensive. Source water protection can be a cost-effective prevention strategy for ensuring safe drinking water supplies for new and existing supply systems. A poor water supply also increases the costs of treatment for both large and small water systems. To address source water protection, the new law creates a program to ensure that states conduct assessments, coordinated with existing information and programs, to determine the vulnerability of sources of drinking water to contamination. Delineating source water protection areas and inventorying sources of contamination ensure that communities know the threats to their drinking water and can develop and implement appropriate protection efforts.

Ken Gilland, Cedar Key, FL

Coastal Resources — Tidal Estuaries, Shoreline Waters, and Coral Reefs

The United States' extensive coastal resources include nearly 67,000 miles of ocean shoreline, more than 5,500 miles of Great Lakes shoreline, nearly 90,500 square miles of estuarine waters, and extensive coral reef areas.

The oceans are one of the earth's most significant resources. The global ocean affects the health and safety of the world by providing food, recreation, local weather amelioration, and global climate stabilization. Predictions say that 75% of the U.S. population will live, work, or play along ocean coasts by the year 2015.

The Great Lakes—Superior, Michigan, Huron, Erie, and Ontario— are an important part of the physical and cultural heritage of North America. Spanning more than 750 miles from west to east, these vast inland freshwater seas have provided water for consumption, transportation, power, recreation, and a host of other uses. The Great Lakes basin is home to more than 10% of the U.S. population and some of the world's largest concentrations of industrial capacity. Many consider the Great Lakes the United States' fourth seacoast.

Estuaries are the waters where rivers meet the oceans and include bays and tidal rivers. These waters serve as nursery areas for many commercial fish and most shellfish populations, including shrimp, oysters, crabs, and scallops. Most of our nation's fish and shellfish industry relies on productive estuarine waters to provide healthy habitat for some stage of fish and shellfish development. Recreational anglers also enjoy harvesting fish that reproduce or feed in estuaries, such as striped bass and flounder.

Coral reef systems include a collection of biological communities, representing one of the most diverse ecosystems in the world. Individual coral, which are tiny animals called polyps, secrete a hard calcium carbonate skeleton, which serves as a uniform base for a colony of coral. Coral reefs provide habitats for a large variety of organisms that rely on the coral as a source of food and shelter. Residents of coral reefs include various sponges; molluscs such as sea slugs, oysters, and clams; crustaceans such as crabs and shrimp; many kinds of sea worms; echinoderms such as star fish and sea urchins; other cnidarians such as jellyfish and sea anemones; various types of fungi; sea turtles; and many species of fish.

Water Quality Assessment

States and tribes rate water quality by comparing data to their state and tribal water quality standards. Water quality standards include narrative and numeric criteria that support specific designated uses. Standards also specify goals to prevent degradation of good quality waters.

States and tribes use their numeric and narrative criteria to evaluate whether the designated uses assigned to the waterbodies are supported. Designated uses reflect the goals of the Clean Water Act. They aim to protect human health and the biological integrity of aquatic ecosystems. The most common designated uses are:

- Aquatic life support
- Drinking water supply
- Recreation such as swimming, fishing, and boating
- Fish consumption.

After comparing water quality data to standards, states and tribes classify the waters into the following categories:

- **Good/Fully Supporting:** Good water quality supports a diverse community of fish, plants, and aquatic insects, as well as the array of human activities assigned to an estuary by the state. These waters meet applicable water quality standards, both criteria and designated use.

- **Good/Threatened:** Good water quality currently supports aquatic life and human activities in and on the estuary. These waters are currently meeting water quality standards, but states and tribes are concerned they may degrade in the near future. These concerns are based on a trend of increasing pollution or land use changes that may threaten future water quality.

- **Fair/Partially Supporting:** Fair water quality supports aquatic communities with fewer species of fish, plants, and aquatic insects and/or pollution occasionally interferes with human activities. These waters are meeting water quality standards most of the time, but exhibit occasional exceedances. For example, runoff during severe thunderstorms may temporarily elevate fecal coliform bacteria densities and indicate that shellfish are not safe to harvest and eat immediately after summer storms.

- **Poor/Not Supporting:** Poor water quality does not support a healthy aquatic community and/or prevents some human activities on the estuary. These waters are not meeting water quality standards. For example, estuarine waters may be devoid of fish for short periods each summer because excessive nutrients from runoff initiate algal blooms that deplete oxygen concentrations.

- **Not Attainable:** The state has performed a use-attainability analysis and demonstrated that support of one or more designated beneficial uses is not attainable due to specific biological, chemical, physical, or economic/social conditions (see Chapter 1 for additional information).

Most states rate how well a waterbody supports individual uses (such as swimming and aquatic life) and then consolidate individual use ratings into a summary table. This table divides assessed waters into those that are:

- **Good** – Fully supporting all of their uses or fully supporting all uses but threatened for one or more uses.

- **Impaired** – Partially or not supporting one or more uses.

- **Not attainable** – Not able to support one or more uses.

It is important to note that five states did not include the effects of statewide fish consumption advisories for mercury when calculating their summary use support status in coastal waters. Alabama, Florida, Louisiana, Mississippi, and Texas excluded the impairment associated with statewide mercury advisories in order to convey information that would have been otherwise masked by the fish consumption advisories. If these advisories had been included, all of the states' coastal waters would receive an impaired rating. (See the discussion of mercury in Chapter 4.)

Similarly, six states did not include the effects of statewide fish consumption advisories for other pollutants. Connecticut and Rhode Island excluded the impairment associated with statewide PCB advisories, Maine excluded the impairment associated with a statewide dioxin advisory for lobster tomalley, Massachusetts excluded the impairment associated with a statewide PCB/organics advisory, and New Jersey and New York excluded the impairment associated with statewide PCB/cadmium/dioxin advisories.

ESTUARIES

Twenty-two of the 27 coastal states, the District of Columbia, the Virgin Islands, and the Delaware River Basin Commission (collectively referred to as states in the rest of this chapter) rated general water quality conditions in some of their estuarine waters (Appendix C, Table C-2, contains individual state data).

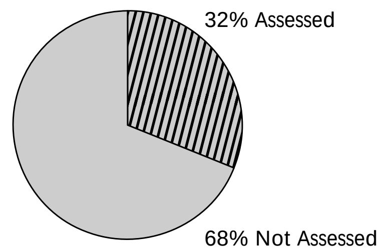
In addition, New Jersey and the Interstate Sanitation Commission reported individual use support status in estuarine waters but did not summarize overall water quality conditions. EPA used shellfishing use support status to represent overall water quality conditions in New Jersey's estuarine waters and fish consumption use support status to represent overall water quality conditions in the Interstate Sanitation Commission's estuarine waters. Puerto Rico also provided information on its estuarine waters based on linear miles rather than square miles. Consequently, the data could not be aggregated with those reported by the states.

Altogether, these states assessed 28,687 square miles of estuarine waters, which equals 32% of the 90,465 square miles of estuarine waters in the nation. The states based 63% of their assessments on monitored data and evaluated 17% of the assessed estuarine waters with qualitative information (see Appendix C, Table C-2, for individual state information). The states did not specify whether 20% of the assessed estuarine waters were monitored or evaluated.

Although the number of assessed estuarine square miles remained fairly constant between 1996 and 1998, the percent of assessed estuarine waters declined significantly. This change is due to the fact that Alaska, Guam, and the Commonwealth of the Northern Mariana Islands provided estimates of their total estuarine waters. These waters represent an increase of over 49,000 square miles of estuarine waters.

Estuaries Assessed by States

1998 28,687 square miles = 32% assessed
Total square miles: 90,465[a,e]



1996 28,819 square miles = 72% assessed
Total square miles: 39,839[b]

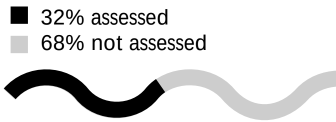
1994 26,847 square miles = 78% assessed
Total square miles: 34,388[c]

1992 27,227 square miles = 74% assessed
Total square miles: 36,890[d]

[a]Source: 1998 state section 305(b) reports.
[b]Source: 1996 state section 305(b) reports.
[c]Source: 1994 state section 305(b) reports.
[d]Source: 1992 state section 305(b) reports.
[e]The total number of estuarine square miles reported by the states increased between 1996 and 1998 because Alaska, Guam, and the Commonwealth of the Northern Mariana Islands provided estimates of their total estuarine waters.

Assessed Waters

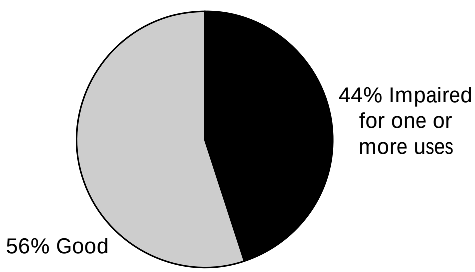
Total estuaries = 90,465 square miles[a]
Total assessed = 28,687 square miles



Of the assessed estuarine waters:

- 63% were monitored
- 17% were evaluated
- 20% were not specified

Assessed Water Quality



[a]Source: 1998 state Section 305(b) reports.

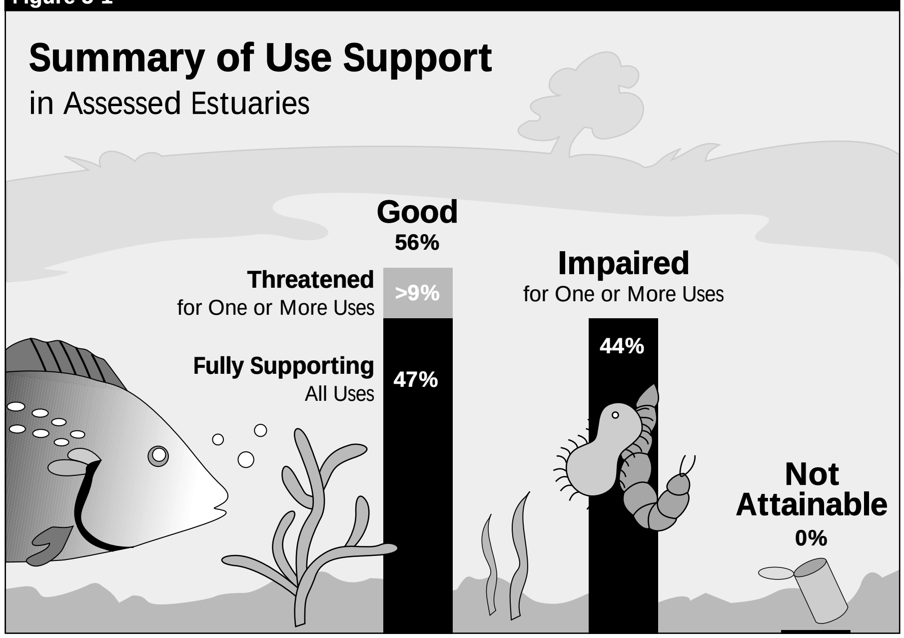
56% of ASSESSED estuaries have good water quality.

The states constantly revise their assessment methods in an effort to improve their accuracy and precision. These changes limit the comparability of data from year to year. Similarly, differences in state assessment methods limit meaningful comparisons of estuarine information submitted by individual states. States devote varying resources to monitoring biological integrity, water chemistry, and toxic pollutants in fish tissues. The wide range in water quality ratings reported by the states reflects both differences in water quality and differences in monitoring and assessment methods.

Summary of Use Support

The states reported that 56% of the assessed estuarine waters have good water quality that fully supports designated uses (Figure 5-1). Of the assessed waters, 47% fully support uses and 9% are threatened for one or more uses. Some form of pollution or habitat degradation impairs the remaining 44% of the assessed estuarine waters.

Figure 5-1



This figure presents the status of the assessed square miles of estuaries. Of 28,687 square miles assessed, 56% fully support their designated uses and 44% are impaired for one or more uses. Nine percent of assessed waters are fully supporting uses but threatened.

Based on data contained in Appendix C, Table C-2.

Individual Use Support

Individual use support assessment provides important detail about the nature of water quality problems in our nation's surface waters. The states establish specific designated uses for waterbodies through their water quality standards. The states consolidate their more detailed uses into five general use categories so that EPA can present a summary of the state and tribal data.

The standard uses are aquatic life support, fish consumption, shellfish harvesting, primary contact recreation (such as swimming and diving), and secondary contact recreation (such as boating). Few states designate saline estuarine waters for drinking water supply use and agricultural use because of high treatment costs.

Twenty-five states reported the individual use support status of their estuarine waters (see Appendix C, Table C-3, for individual state information). Most often, these states examined aquatic life conditions and swimming use in their estuarine waters (Figure 5-2). The states reported that pollutants:

- Impact aquatic life in 7,779 square miles of estuarine waters (about 34% of the 22,447 square miles assessed for aquatic life support)
- Restrict fish consumption in 5,432 square miles of estuarine waters (about 35% of the 15,260 square miles assessed for fish consumption)
- Prevent shellfish harvesting criteria in 4,929 square miles of estuarine waters (27% of the 18,212 square miles assessed for shellfishing use support).
- Violate swimming criteria in 1,976 square miles of estuarine waters (9% of the 21,214 square miles assessed for swimming use support).

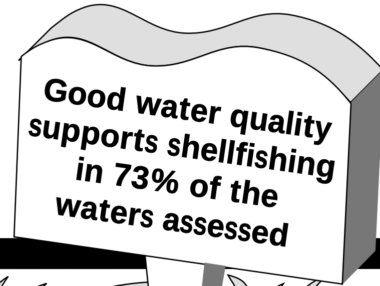
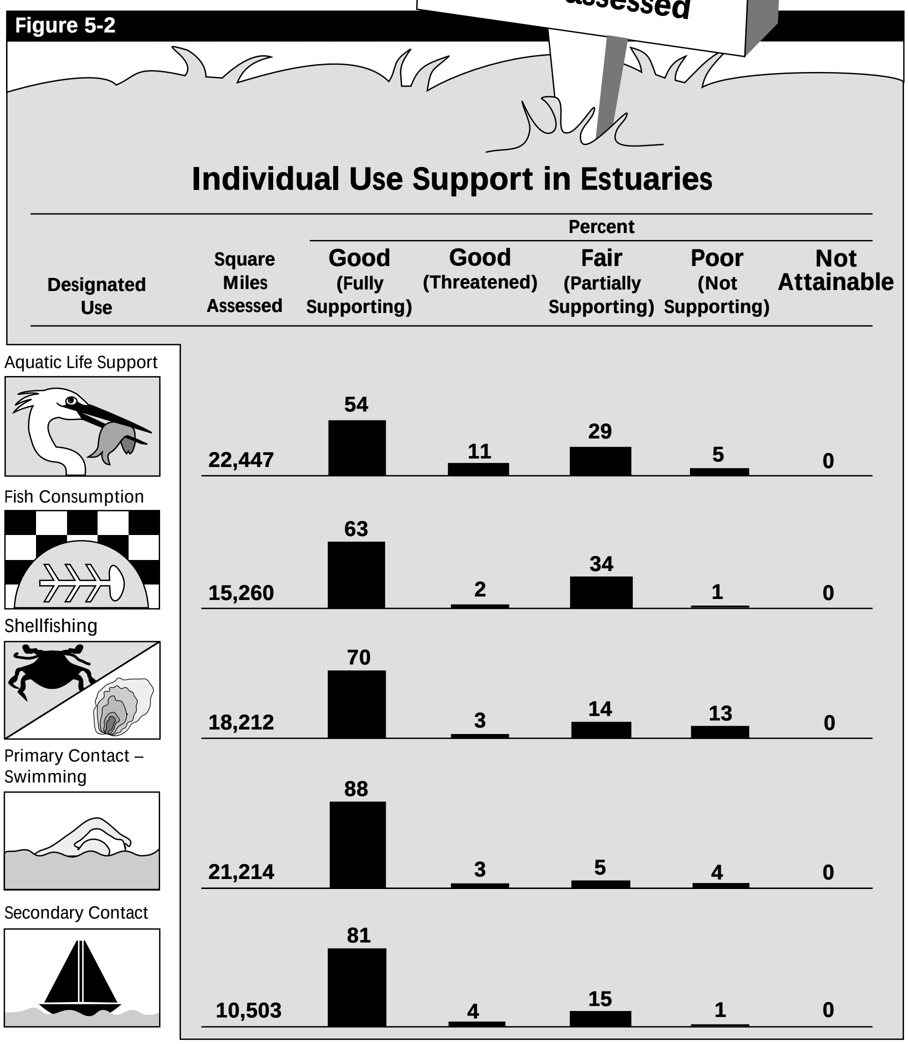


Figure 5-2



This figure presents a tally of the square miles of estuaries assessed by states for each category of designated use. For each category, the figure presents a summary of the proportion of the assessed waters rated according to quality.

Based on data contained in Appendix C, Table C-3.

Water Quality Problems Identified in Estuaries

When states and tribes rate waters as impaired, they also attempt to identify the causes and sources of impairment. Figures 5-3 and 5-4 identify the pollutants and sources of pollutants that impair the most square miles of assessed estuarine waters.

The following sections describe the leading pollutants and sources of impairment identified in estuaries. It is important to note that the information about pollutants and sources is incomplete. The states and tribes do not always report the pollutant or source of pollutants impacting every impaired estuarine waterbody. In some cases, they may recognize that water quality does not fully support a designated use but may not have adequate data to document the specific pollutant or stressor responsible for the impairment. Sources of impairment are even more difficult to identify than pollutants and stressors.

Pollutants and Processes Impacting Estuaries

Twenty-seven states reported pollutants and processes related to human activities that impact some of their estuarine waters (see Appendix C, Table C-4, for individual state information).

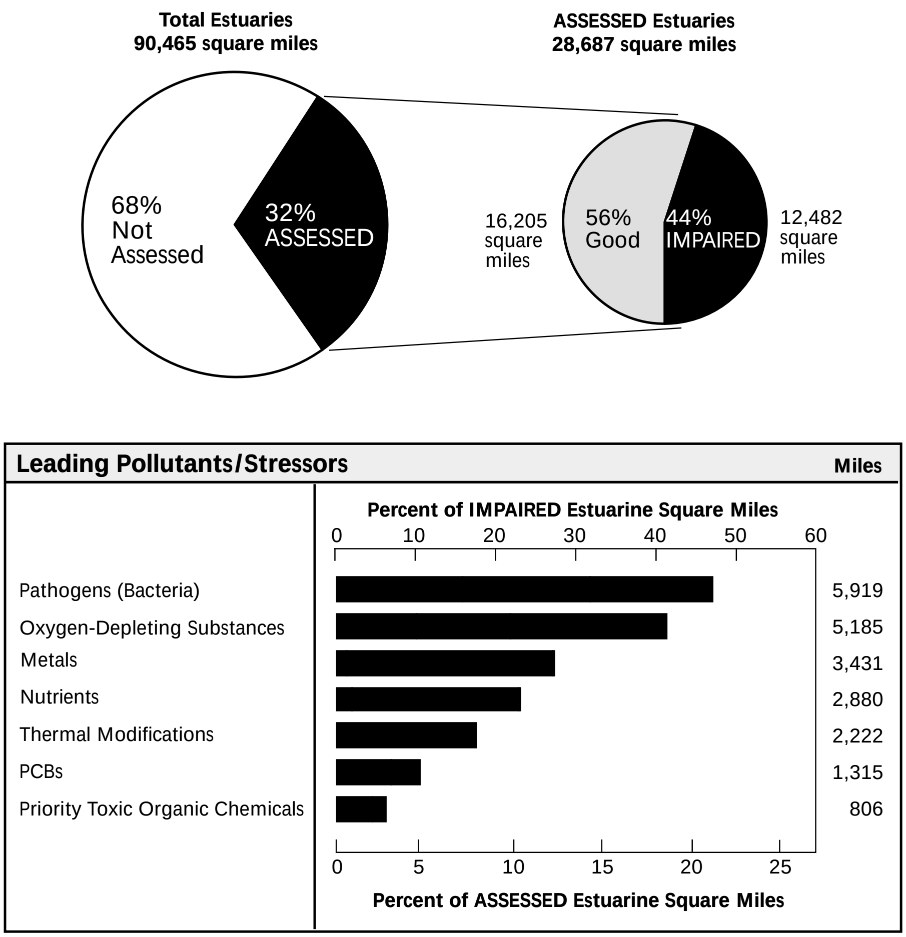
Often, more than one pollutant or stressor impacts a single estuarine waterbody. In such cases, the states and other jurisdictions count a single square mile of estuary under each pollutant or stressor category that impacts the estuary. Therefore, the percentages of estuarine waters impaired by all the pollutant and process categories do not add up to 100% in Figure 5-3.

The states identified more square miles of estuarine waters polluted by bacteria (pathogens) than any other pollutant or stressor (Figure 5-3). Twenty-five states reported that bacteria pollute 5,919 square miles of estuarine waters (21% of the assessed estuarine waters and 47% of the impaired estuarine waters). Most states monitor indicator bacteria, such as *Escherichia coli*, that inhabit the digestive tracts of humans and other warm-blooded animals and populate sewage in high densities. Such bacteria provide evidence that an estuary is contaminated with sewage that may contain numerous viruses and bacteria that cause illness in people. Most states monitor the indicator bacteria rather than run multiple tests to detect the numerous harmful viruses and bacteria in sewage.

Pathogenic viruses and bacteria seldom impact aquatic organisms such as fish and shellfish. However, shellfish can accumulate bacteria and viruses from contaminated water and cause illness when ingested. Therefore, the Food and Drug Administration and the states restrict the harvest and sale of shellfish grown in waters polluted with indicator bacteria. Bacteria also interfere with recreational activities because some pathogens can be

Figure 5-3

Leading POLLUTANTS in Impaired Estuaries



States assessed 32% of the total square miles of estuaries for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 56% are rated as good and 44% as impaired. When states identify waters that are impaired, they describe the pollutants or processes causing or contributing to the impairment. The bar chart presents the leading causes and the number of estuarine square miles impacted. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these pollutants. The lower axis compares the square miles impacted by the pollutant to the total ASSESSED square miles. The upper axis compares the square miles impacted by the pollutant to the total IMPAIRED square miles.

Based on data contained in Appendix C, Table C-4.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair an estuary.

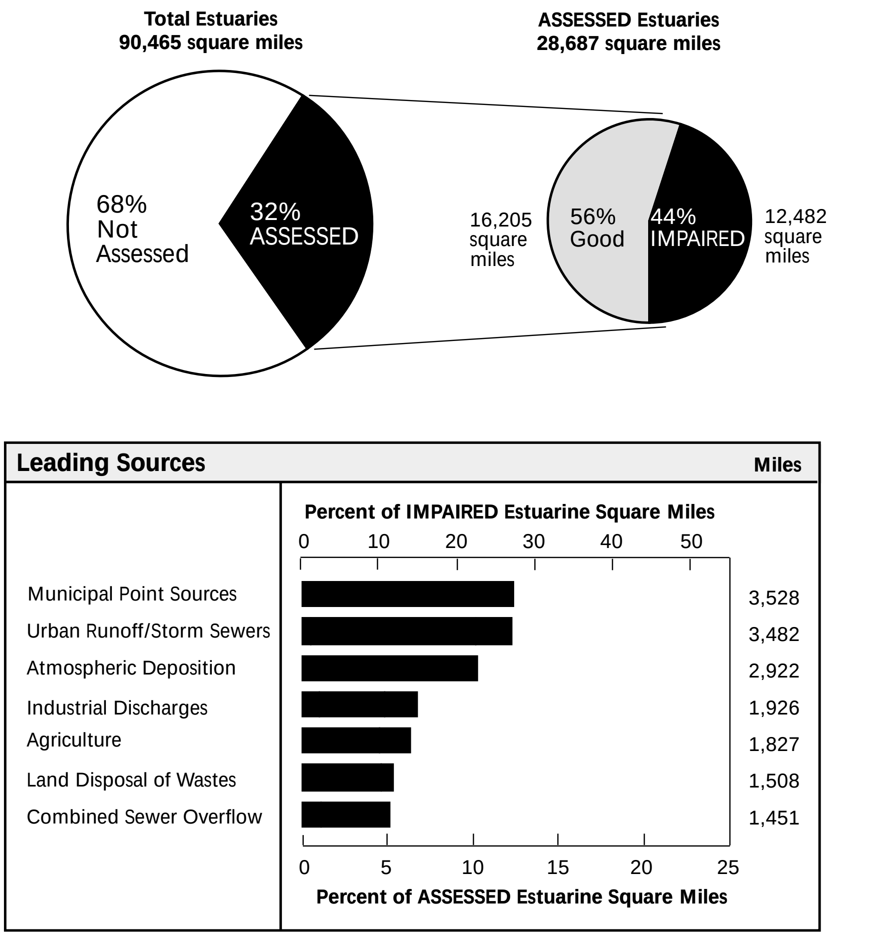
The pollutants/processes and sources shown here may not correspond directly to one another (i.e., the leading pollutant may not originate from the leading source). This may occur because a major pollutant may be released from many minor sources. It also happens when states do not have the information to determine all the sources of a particular pollutant/stressor.

According to the states, **PATHOGENS** (bacteria) are the most common pollutant affecting assessed estuaries. High levels of pathogens prompt health officials to close areas to shellfish harvesting and swimming. Pathogens (bacteria)

- Are found in 21% of the assessed portions of estuaries (see Figure 5-3)
- Contribute to 47% of reported water quality problems in the impaired portions of estuaries.

Figure 5-4

Leading SOURCES of Estuary Impairment*



States assessed 32% of the total square miles of estuaries for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 56% are rated as good and 44% as impaired. When states identify waters that are impaired, they also describe the sources of pollutants associated with the impairment. The bar chart presents the leading sources and the number of estuarine square miles they impact. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these sources. The lower axis compares the square miles impacted by the source to the total ASSESSED square miles. The upper axis compares the square miles impacted by the source to the total IMPAIRED square miles.

Based on data contained in Appendix C, Table C-5.

*Excluding unknown, natural, and "other" sources.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair an estuary.

According to the states, **MUNICIPAL POINT SOURCES and URBAN RUNOFF/STORM SEWERS** are the leading sources of pollution in assessed estuaries. These sources each

- Affect 12% of the assessed portions of estuaries
- Contribute to 28% of reported water quality problems in the impaired portions of estuaries (see Figure 5-4).

transmitted by contact with contaminated water or ingestion during swimming (Figure 5-5).

Twenty-two states reported that oxygen depletion from organic wastes impacts 5,185 square miles of estuarine waters (18% of the assessed estuarine waters and 42% of the impaired estuarine waters). Oxygen-depletion may trigger fish kills and foul odors and can adversely affect aquatic life.

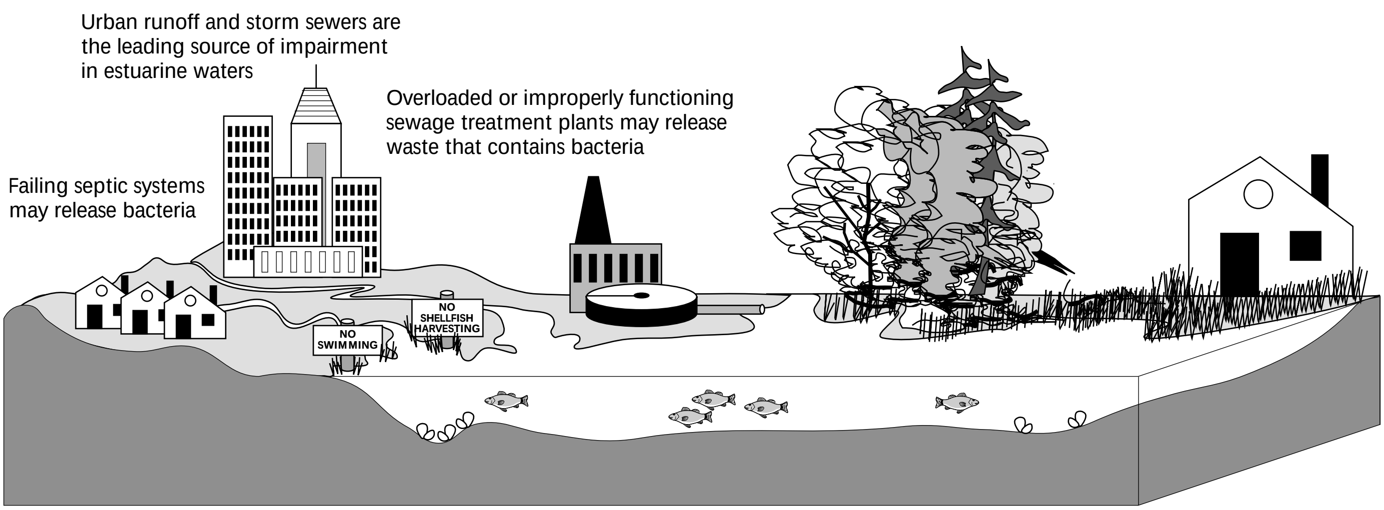
The states report that metals pollute 3,431 square miles of estuaries (12% of the assessed estuarine waters and 27% of the impaired estuarine waters). Similar to lakes, this is mainly due to the widespread detection of mercury in fish tissue samples. See the highlight on page 196 for more information on mercury contamination of fish tissue.

The states also report that excess nutrients impact 2,880 square miles (10% of the assessed estuarine waters and 23% of the impaired estuarine waters). As in lakes, extra inputs of nutrients destabilize estuarine ecosystems. When temperature and light conditions are favorable, excessive nutrients stimulate population explosions of undesirable algae whose decomposition causes oxygen depletion.

The states report that thermal modifications (activities that alter the temperature of estuarine waters) degrade 2,222 square miles (8% of the assessed estuarine waters and 18% of the impaired

Figure 5-5

Sources of Bacteria



Some bacteria, such as fecal coliforms, provide evidence that an estuary is contaminated with fecal material that may contain pathogenic bacteria and viruses harmful to people. Often, the pathogenic viruses and bacteria do not adversely impact aquatic life such as fish and shellfish. However, shellfish may accumulate bacteria and viruses that cause human diseases when ingested. Therefore, officials restrict shellfish harvesting in contaminated waters to protect public health. Bacteria also impair swimming uses because some pathogenic bacteria and viruses can be transmitted by contact with contaminated water.

estuarine waters). Estuaries are often home to large utilities that discharge heated cooling water as they produce electricity. The change in temperature may impact the ability of fish to spawn. In addition, heated water holds less dissolved oxygen, which is needed by many aquatic organisms.

The states determined that PCBs pollute 1,315 square miles (5% of the assessed estuarine waters and 11% of the impaired estuarine waters). Although use of PCBs has been banned, quantities of the chemical persist in the environment. PCBs bioaccumulate in the fatty tissue of organisms. Consumption of contaminated fish and shellfish can pose public health threats.

The states also reported that priority toxic organic chemicals pollute 806 square miles (3% of the assessed estuarine waters and 6% of the impaired estuarine waters). These chemicals, which include pesticides such as DDT and chlordane, pose risks to human health and aquatic life.

Oxygen-depleting substances, metals, nutrients, and priority organic chemicals are widespread problems reported by more than 10 of the 27 coastal states. In contrast, only a few states reported significant impacts from thermal modifications and PCBs.

Sources of Pollutants Impacting Estuaries

Twenty-six states reported sources of pollution related to human activities that impact some of their estuarine waters (see Appendix C, Table C-5, for individual state information). These states reported that municipal sewage treatment plants are the most widespread source of pollution in their assessed estuarine waters. Pollutants in municipal discharges degrade aquatic life or interfere with public use of 3,528 square miles of estuarine waters (12% of the assessed estuarine waters and 28% of the impaired estuarine waters) (Figure 5-4).

The states also reported that pollution from urban runoff and storm sewers impacts 3,482 square miles of estuarine waters (12% of the assessed estuarine waters and 28% of the impaired estuarine waters), atmospheric deposition of pollutants impacts 2,922 square miles of estuarine waters (10% of the assessed estuarine waters and 23% of the impaired estuarine waters), industrial discharges pollute 1,926 square miles of estuarine waters (7% of the assessed estuarine waters and 15% of the impaired estuarine waters), agriculture pollutes 1,827 square miles of estuarine waters (6% of the assessed estuarine waters and 15% of the impaired estuarine waters), land disposal of wastes pollutes 1,508 square miles (5% of the assessed estuarine waters and 12% of the impaired estuarine waters), and pollution from combined sewer overflows impairs 1,451 square miles of estuarine waters (5% of the assessed estuarine waters and 12% of the impaired estuarine waters). Urban sources contribute more to the degradation of estuarine waters than does agriculture because urban centers are located adjacent to most major estuaries.

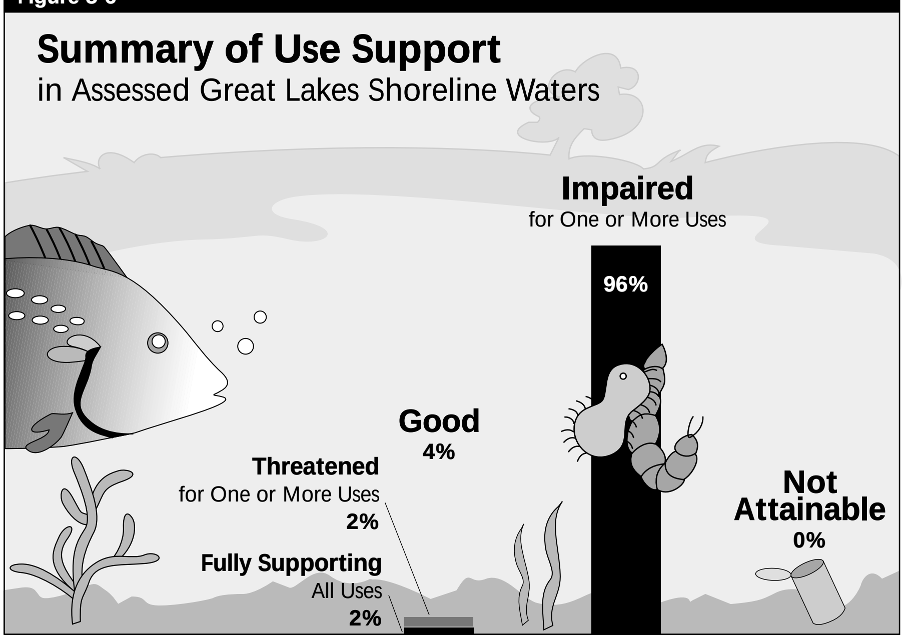
GREAT LAKES SHORELINE

Five of the eight Great Lakes states rated general water quality conditions in 4,950 miles of Great Lakes shoreline in their 1998 Section 305(b) reports (see Appendix F, Tables F-1 and F-2, for individual state information). These states based 74% of their assessments on monitored data and evaluated 14% of the assessed shoreline miles with qualitative information (see Appendix F, Table F-2, for individual state information). The states did not specify whether the remaining 12% of the assessed shoreline miles were monitored or evaluated.

Summary of Use Support

The states reported that only 4% of their assessed Great Lakes shoreline miles have good water quality that fully supports designated uses (Figure 5-6). Of the assessed waters, 2% fully support uses and 2% fully support uses but are threatened for one or more uses. Some form of pollution or habitat degradation impairs the remaining 96% of assessed Great Lakes shoreline. This degradation leads to fish consumption advisories. Nearly all of the Great Lakes shoreline supports recreation and drinking water uses.

Figure 5-6

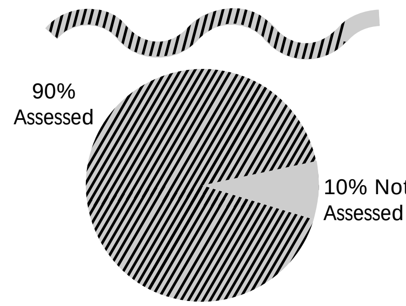


This figure presents the status of the assessed Great Lakes shoreline waters. Of the 4,950 miles of Great Lakes shoreline assessed, 4% fully support their designated uses and 96% are impaired for one or more uses. Two percent of the assessed waters are fully supporting uses but threatened.

Based on data contained in Appendix F, Table F-2.

Great Lakes Shoreline Miles Assessed by States

1998 4,950 miles = 90% assessed
Total shoreline miles: 5,521



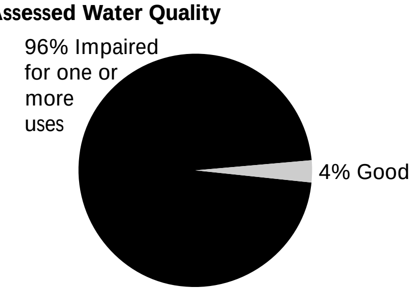
1996 5,186 miles = 94% assessed
Total shoreline miles: 5,521[b]

1994 5,224 miles = 94% assessed
Total shoreline miles: 5,559[c]

1992 5,319 miles = 99% assessed
Total ocean shore miles: 20,121[d]

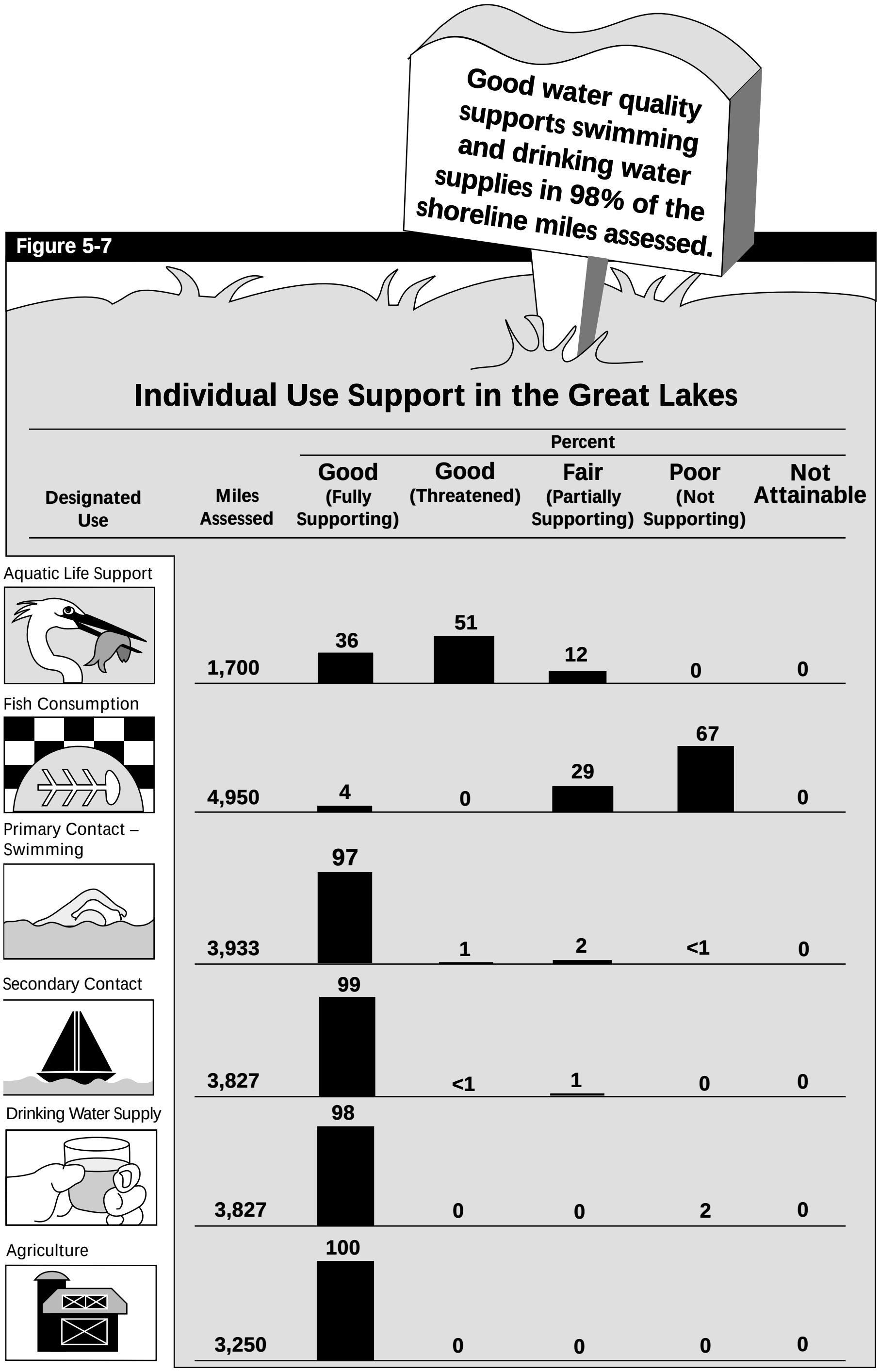
Of the assessed Great Lakes shoreline waters:
- 74% were monitored
- 14% were evaluated
- 12% were not specified

Assessed Water Quality



[a]Source: 1998 state section 305(b) reports.
[b]Source: 1996 state section 305(b) reports.
[c]Source: 1994 state section 305(b) reports.
[d]Source: 1992 state section 305(b) reports.

Figure 5-7



This figure presents a tally of the miles of Great Lakes shoreline assessed by states for each category of designated use. For each category, the figure presents a summary of the proportion of the assessed waters rated according to quality.

Based on data contained in Appendix F, Table F-3.

Individual Use Support

The states establish specific designated uses for waterbodies through their water quality standards. The states consolidate their more detailed uses into six general use categories so that EPA can present a summary of the state and tribal data. The standard uses consist of aquatic life support, fish consumption, primary contact recreation (such as swimming and diving), secondary contact recreation (such as boating), drinking water supply, and agricultural use.

Five of the eight Great Lakes states reported the individual use support status of their Great Lakes shoreline (see Appendix F, Table F-3, for individual state information). These states report that swimming, secondary contact, drinking water supply, and agricultural uses are met in nearly all assessed shoreline miles (Figure 5-7). The reporting states indicated that the greatest impacts to Great Lakes shoreline are on fishing activities.

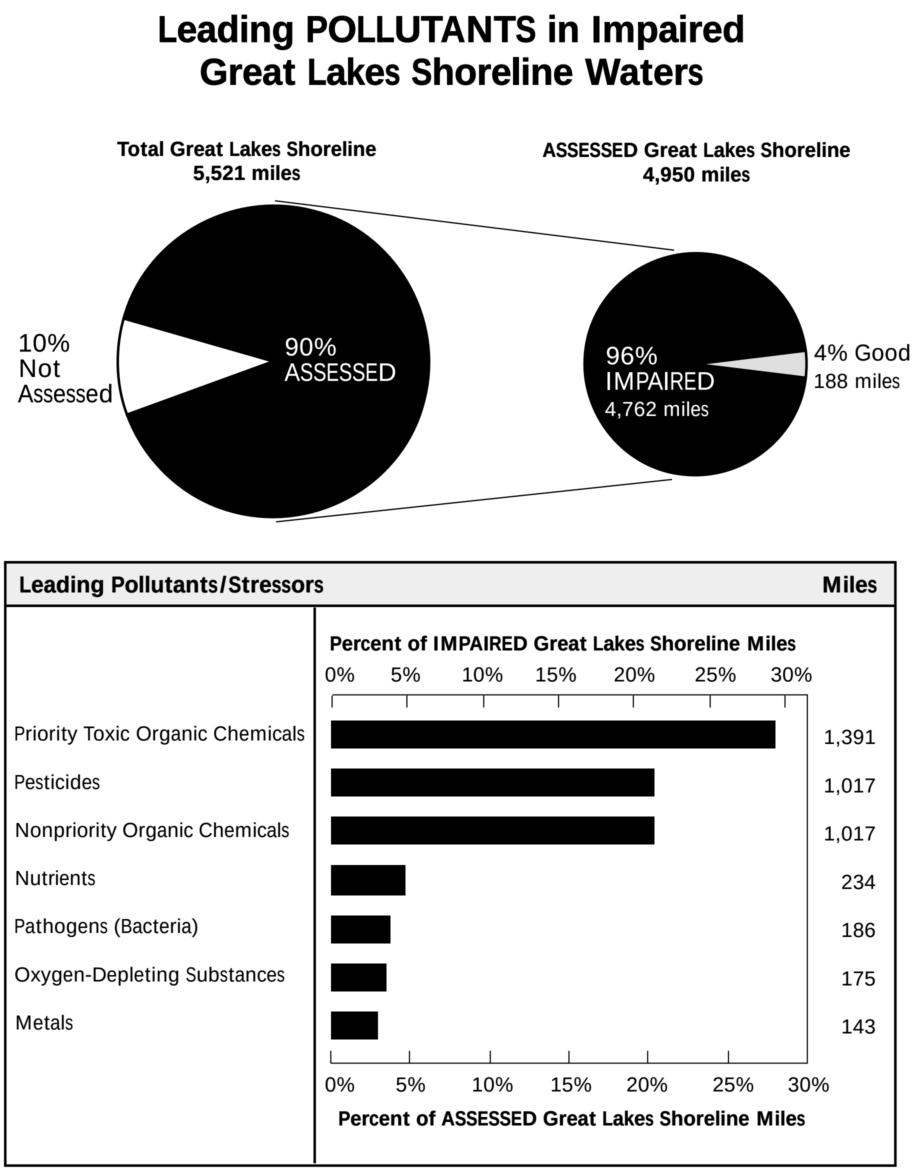
The states bordering the Great Lakes have issued advisories to restrict consumption of fish caught along their entire shorelines. Depending upon location, mercury, PCBs, pesticides, or dioxins are found in fish tissues at levels that exceed standards set to protect human health. The water concentrations of most organochlorine compounds have declined dramatically since control measures began in the mid-1970s. As a result, concentrations of these contaminants in fish tissue have also declined, although 3,313 shoreline miles (96% of the assessed Great Lakes waters) still fail to fully support fish consumption uses.

Water Quality Problems Identified in Great Lakes Shoreline Waters

Only three Great Lakes states identified pollutants and sources of pollutants degrading Great Lakes shoreline (Appendix F, Tables F-4 and F-5, contain individual state information). Limited conclusions can be drawn from such a small fraction of the nation's Great Lakes shoreline miles. The top causes of impairment cited by the three states were priority organic chemicals, pesticides, and nonpriority organic chemicals. In addition, excess nutrients, bacteria (pathogens), oxygen-depleting substances, and metals caused water quality impairments in more localized areas (Figure 5-8).

The states reported that atmospheric deposition, discontinued discharges from pipes, contaminated sediments, industrial discharges, urban runoff and storm sewers, agriculture, and municipal sewage treatment plants are the primary sources of pollutants that impair their Great Lakes shoreline waters (Figure 5-9). Discontinued discharges refer to historical discharges that resulted in sediment contamination that remains today.

Figure 5-8



States assessed 90% of the total miles of Great Lakes shoreline for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 4% are rated as good and 96% as impaired. When states identify waters that are impaired, they describe the pollutants or processes causing or contributing to the impairment. The bar chart presents the leading causes and the number of Great Lakes shoreline miles impacted. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these pollutants. The lower axis compares the miles impacted by the pollutant to the total ASSESSED miles. The upper axis compares the miles impacted by the pollutant to the total IMPAIRED miles.

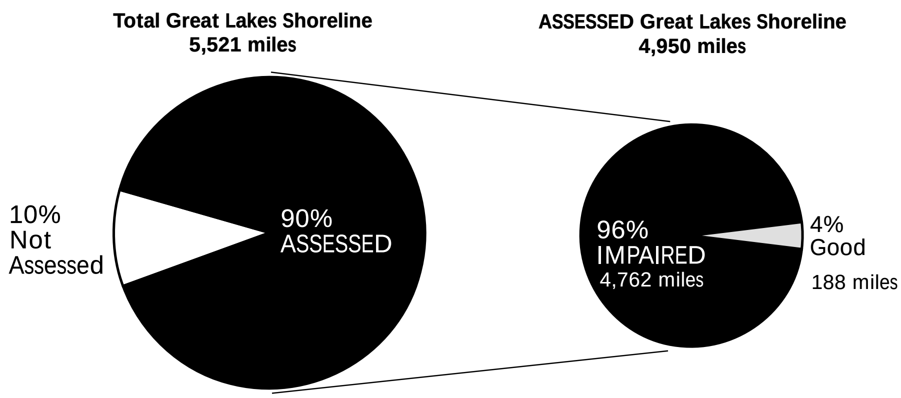
Based on data contained in Appendix F, Table F-4.

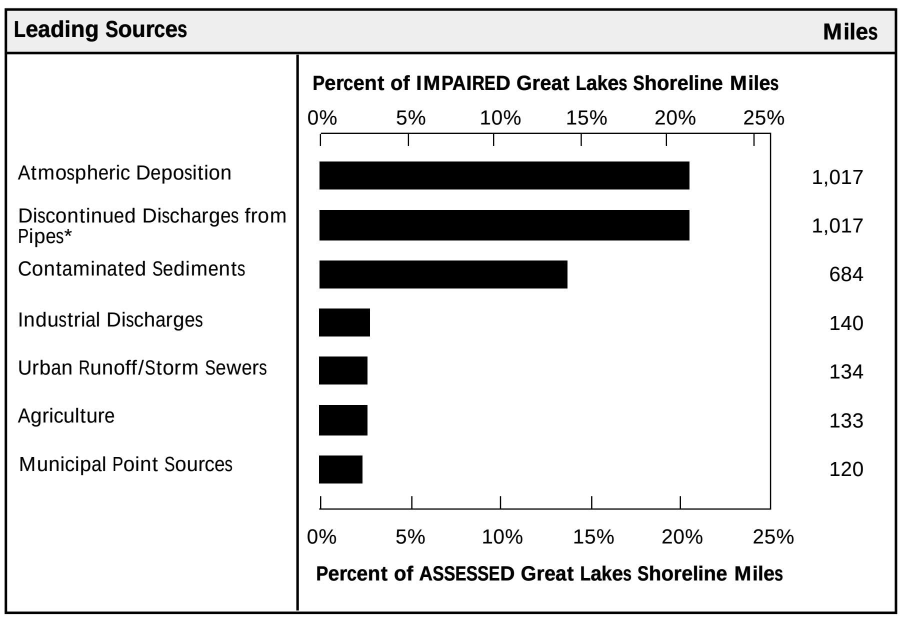
Note: Percentages do not add up to 100% because more than one pollutant or source may impair a segment of ocean shoreline.

The pollutants/processes and sources shown here may not correspond directly to one another (i.e., the leading pollutant may not originate from the leading source). This may occur because a major pollutant may be released from many minor sources. It also happens when states do not have the information to determine all the sources of a particular pollutant/stressor.

Figure 5-9

Leading SOURCES of Great Lakes Shoreline Impairment





* These discharges resulted in sediment contamination that remains today.

States assessed 90% of the total miles of Great Lakes shoreline for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 4% are rated as good and 96% as impaired. When states identify waters that are impaired, they also describe the sources of pollutants associated with the impairment. The bar chart presents the leading sources and the number of Great Lakes shoreline miles they impact. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these sources. The lower axis compares the miles impacted by the source to the total ASSESSED miles. The upper axis compares the miles impacted by the source to the total IMPAIRED miles.

Based on data contained in Appendix F, Table F-5.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a segment of ocean shoreline.

OCEAN SHORELINE WATERS

Fourteen of the 27 coastal states and territories rated general water quality conditions in some of their coastal waters (see Appendix C, Table C-6, for individual state information). In addition, New Jersey reported individual use support status in ocean shoreline waters but did not summarize general water quality conditions. EPA used swimming use support status to represent general water quality conditions in New Jersey's ocean shoreline waters. Texas provided information on its ocean shoreline waters based on square miles rather than linear miles. Consequently, the data could not be aggregated with those reported by the other states.

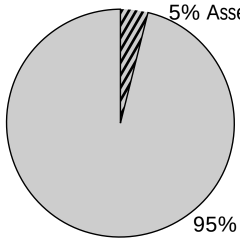
All together, these states assessed 3,130 miles of ocean shoreline, which equals 5% of the nation's coastline (including Alaska's 44,000 miles of coastline) or 14% of the 22,419 miles of national coastline excluding Alaska. The states based 25% of their assessments on monitored data and 66% on qualitative information (see Appendix C, Table C-6, for individual state information). The states did not specify whether 9% of the assessed coastal shoreline waters were monitored or evaluated.

The number of ocean shoreline miles assessed by the states decreased slightly between the two reporting cycles. This decrease is due primarily to the fact that, in 1998, the assessment information provided by Texas could not be aggregated with that reported by the other states. Also during the 1998 reporting cycle, the states' estimates of their total ocean shoreline miles increased by more than 8,000 miles. This change is due to the fact that Alaska refined its estimate of shoreline mileage and Guam and the Commonwealth of the Northern Marina Islands provided estimates of their total ocean shoreline. Excluding Alaska, the other 14 reporting states provided information on 69% of their own 4,536 coastal shoreline miles.

Ocean Shoreline Waters Assessed by States

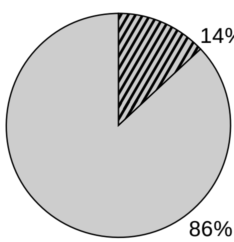
Including Alaska's Ocean Shoreline

1998 3,130 miles = 5% assessed
Total ocean shoreline miles: 66,645[a]



Excluding Alaska's Ocean Shoreline

1998 3,130 miles = 14% assessed
Total ocean shoreline miles: 22,419

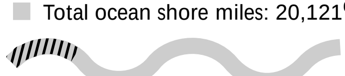


Of the assessed ocean shoreline miles:
- 25% were monitored
- 66% were evaluated
- 9% were not specified

1996 3,651 miles = 6% assessed
Total ocean shoreline miles: 22,585[b]

1994 5,208 miles = 9% assessed
Total ocean shoreline miles: 58,421[c]

1992 3,398 miles = 17% assessed
Total ocean shore miles: 20,121[d]

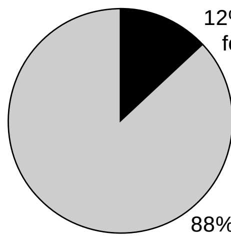


[a]Source: 1998 state section 305(b) reports.
[b]Source: 1996 state section 305(b) reports.
[c]Source: 1994 state section 305(b) reports.
[d]Source: 1992 state section 305(b) reports.

Summary of Use Support

The states reported that 88% (2,753 miles) of their assessed ocean shoreline miles have good quality that supports a healthy aquatic community and public activities (Figure 5-10). Of the assessed waters, 80% fully support designated uses and 8% are threatened for one or more uses. Some form of pollution or habitat degradation impairs the remaining 12% of the assessed shoreline (377 miles).

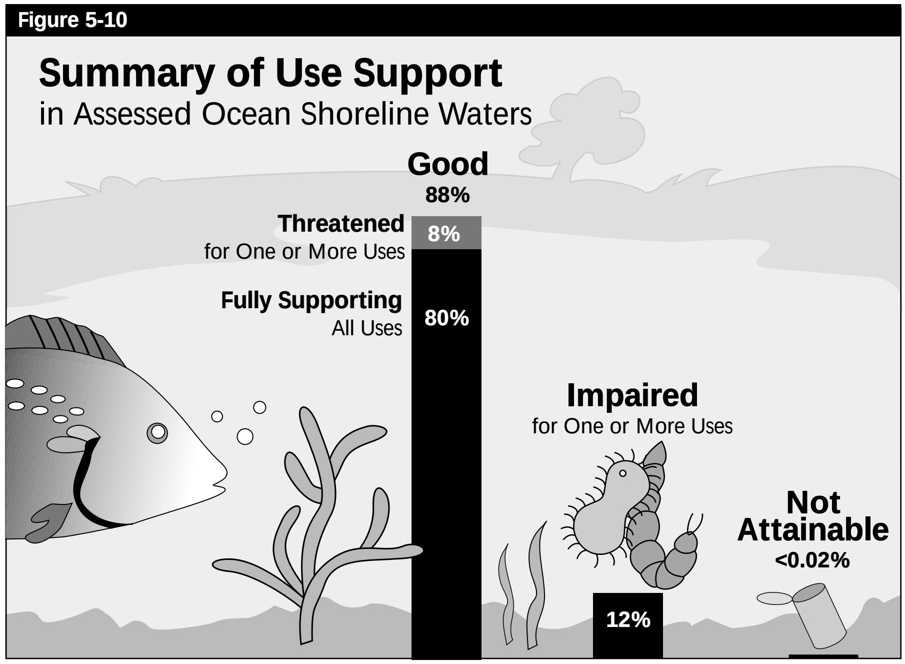
Assessed Water Quality



Individual Use Support

The states establish specific designated uses for waterbodies through their water quality standards. The states consolidate their more detailed uses into five general

Figure 5-10



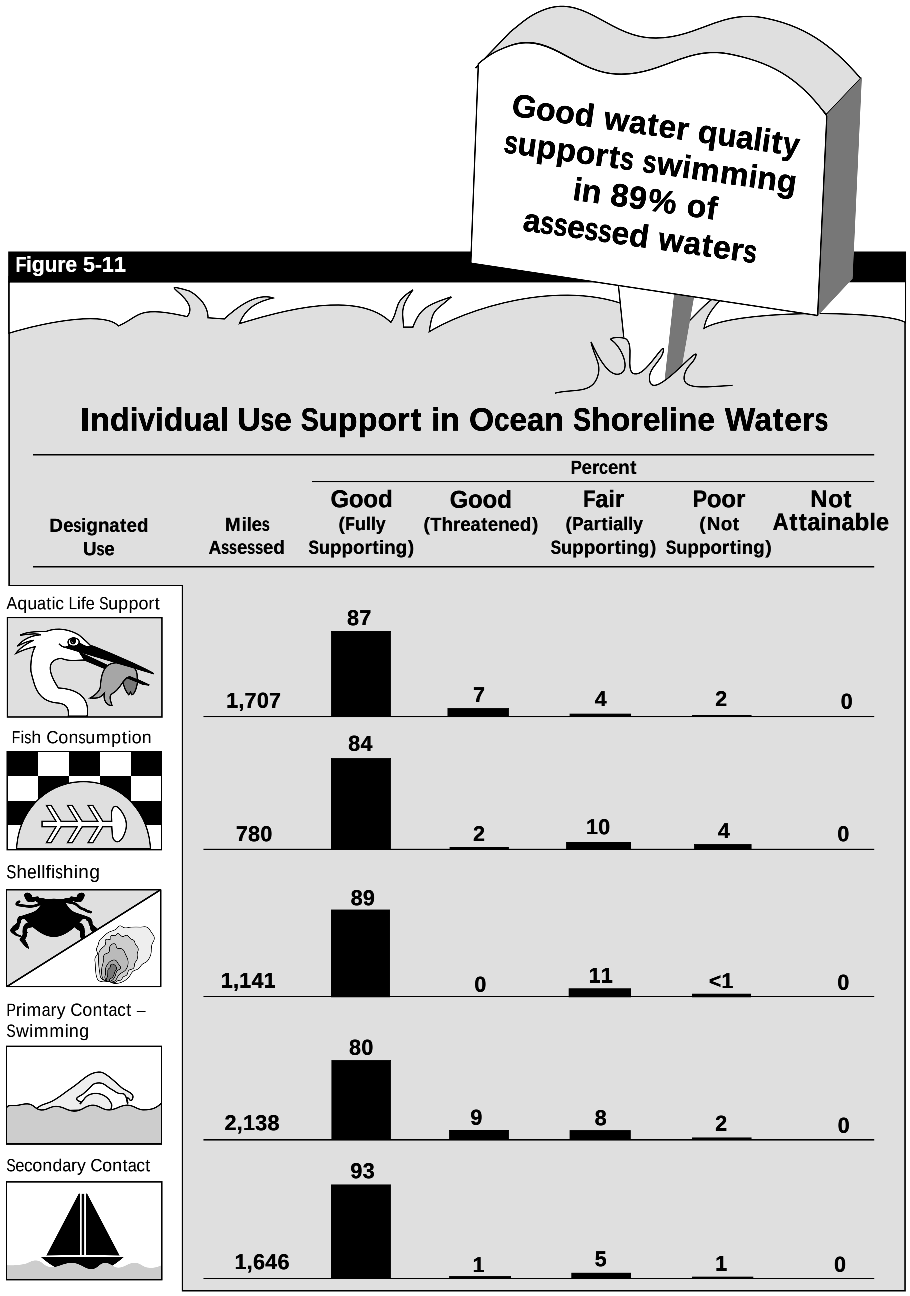
This figure presents the status of the assessed miles of ocean shoreline. Of the 3,130 miles ocean shoreline assessed, 88% fully support their designated uses and 12% are impaired for one or more uses. Eight percent of the assessed waters are fully supporting uses but threatened.

Based on data contained in Appendix C, Table C-6.

use categories so that EPA can present a summary of the state and tribal data. The standard uses consist of aquatic life support, fish consumption, shellfish harvesting, primary contact recreation (such as swimming and diving), and secondary contact recreation (such as boating). Few states designate saline ocean waters for drinking water supply use and agricultural use because of high treatment costs.

The states provided limited information on individual use support in ocean shoreline waters (Appendix C, Table C-7, contains individual state information). Thirteen states rated swimming use in their ocean shoreline waters, but only nine states rated aquatic life support, six rated fish consumption use, eight rated shellfishing support, and nine rated secondary contact recreation use. Limited conclusions can be drawn from such a small fraction of the nation's ocean shoreline miles (Figure 5-11).

It is important to note that eleven states have adopted statewide coastal fish consumption advisories for mercury, PCBs, and other pollutants. The effect of these advisories is not reflected in Figure 5-11.

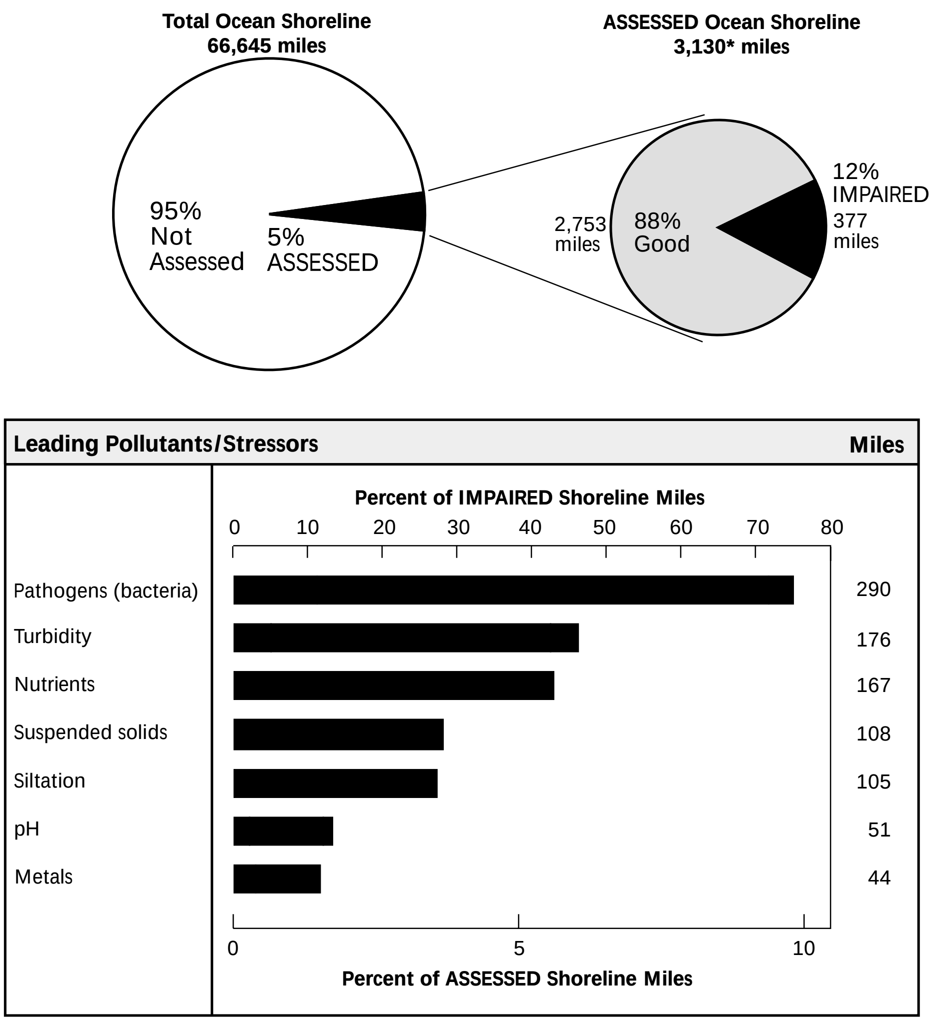


This figure presents a tally of the miles of ocean shoreline assessed by states for each category of designated use. For each category, the figure presents a summary of the proportion of the assessed waters rated according to quality.

Based on data contained in Appendix C, Table C-7.

Figure 5-12

Leading POLLUTANTS in Impaired Ocean Shoreline Waters



States assessed 5% of the total miles of ocean shoreline for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 88% are rated as good and 12% as impaired. When states identify waters that are impaired, they describe the pollutants or processes causing or contributing to the impairment. The bar chart presents the leading causes and the number of ocean shoreline miles impacted. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these pollutants. The lower axis compares the miles impacted by the pollutant to the total ASSESSED miles. The upper axis compares the miles impacted by the pollutant to the total IMPAIRED miles.

Based on data contained in Appendix C, Table C-8.

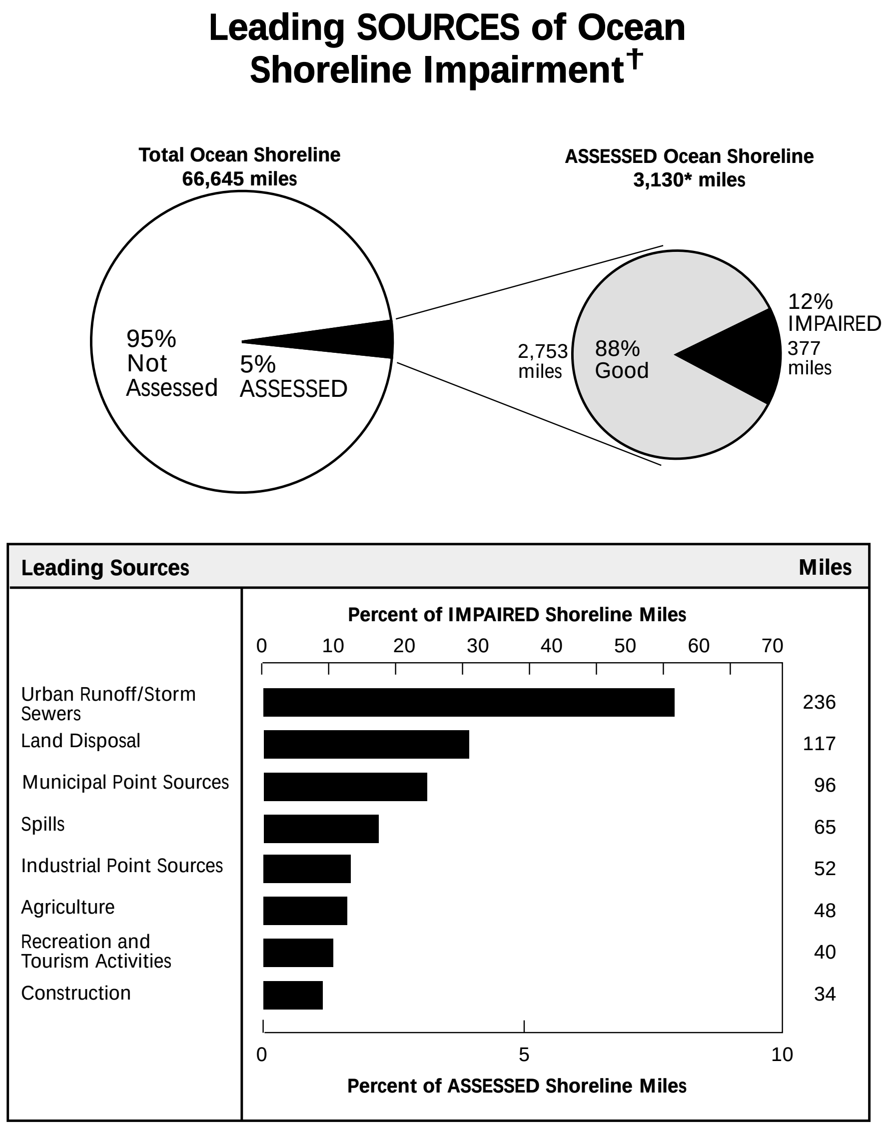
*Includes miles assessed as not attainable.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a segment of ocean shoreline.

Water Quality Problems Identified in Ocean Shoreline Waters

Of the 15 states that reported on coastal waters, 10 identified pollutants and sources of pollutants degrading ocean shoreline waters (Appendix C, Tables C-8 and C-9, contain individual state information). The primary pollutants and stressors reported by the 10 states include bacteria (pathogens), turbidity, excess nutrients, suspended solids, siltation, acidity (pH), and metals (Figure 5-12). The primary sources reported include urban runoff and storm sewers, land disposal of wastes, municipal sewage treatment plants, accidental spills, industrial discharges, agriculture, recreation and tourism activities, and construction (Figure 5-13).

Figure 5-13



States assessed 5% of the total miles of ocean shoreline for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 88% are rated as good and 12% as impaired. When states identify waters that are impaired, they also describe the sources of pollutants associated with the impairment. The bar chart presents the leading sources and the number of ocean shoreline miles they impact. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these sources. The lower axis compares the miles impacted by the source to the total ASSESSED miles. The upper axis compares the miles impacted by the source to the total IMPAIRED miles.

Based on data contained in Appendix C, Table C-9.

†Excluding natural sources.

*Includes miles assessed as not attainable.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a segment of ocean shoreline.

The pollutants/processes and sources shown here may not correspond directly to one another (i.e., the leading pollutant may not originate from the leading source). This may occur because a major pollutant may be released from many minor sources. It also happens when states do not have the information to determine all the sources of a particular pollutant/stressor.

CORAL REEFS

Among the most productive ecosystems in the ocean, coral reefs are inhabited by a wide variety of fish, invertebrate, and plant species. These reefs are the living jewels that encircle the shoreline in many tropical areas, providing important assets to local and national economies, including fisheries for food, materials for new medicines, and income from tourism and recreation. Coral reefs also provide coastal communities with protection from storms.

Coral reef areas are found in only three states—Florida, primarily in the Florida Keys; Hawaii, throughout the Hawaiian archipelago; and Texas, in the offshore Flower Gardens (Figure 5-14). Lush reef areas are also found in five U.S. territories in both the Atlantic and Pacific regions, including American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

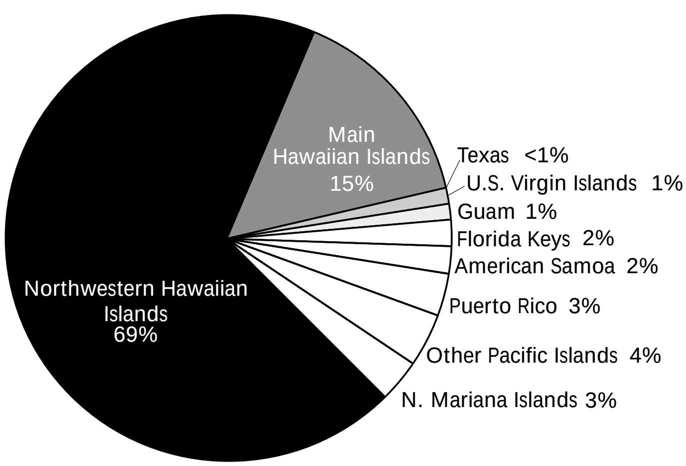
The proximity of coral reefs to land makes them particularly sensitive to impacts from human activities. Because they depend on light, coral reefs require clear water for growth and can be severely damaged by sediment or other factors that reduce water clarity or quality. Recent evidence indicates that coral reefs are deteriorating worldwide, and many are in crisis. Symptoms include loss of hard corals, increased abundance of algae, and a dramatic increase in bleaching episodes and disease outbreaks. In an effort to prevent further loss of coral reef ecosystems, on June 11, 1998, President Clinton signed Executive Order 13089 on Coral Reef Protection, which created the U.S. Coral Reef Task Force. The task force is charged with the following duties:

- Mapping and monitoring reefs
- Researching coral reef degradation
- Working to implement measures to protect reefs
- Promoting reef conservation worldwide.

Efforts are under way in Hawaii, Florida, and American Samoa to assess the status of coral reefs and identify pollutants and stressors to coral reef ecosystems. The findings will be used to develop management actions to protect coral reefs in these states.

Figure 5-14

U.S. Coral Reef Areas



Hawaii's Coral Reefs

The islands of the Hawaiian archipelago are isolated by over 2,000 miles of ocean from any major land mass. These remote islands consist of 8 major islands and 124 smaller islands, coral atolls, and shoals. Because of its great distance from all other major land forms, Hawaii has an extremely high level of endemic species—species that are found nowhere else on earth.

Coral reefs are important to the Hawaiian Islands for several reasons. The existence of coral reefs protects and stabilizes the shoreline from dangerous waves and storm surge. The reefs are also the underwater structures that create Hawaii's famous surf beaches. Most of the sand on Hawaii's beaches comes from the breakdown of coral from both physical and biological activity as the polyps and small portions of the coral skeleton are consumed by coral-grazing fish such as parrotfish. Because they provide shelter for a wide variety of fish and invertebrate species, coral reefs are a vital habitat. They provide nursery areas for many types of juvenile fish and shellfish species. Reefs are also valuable sources of medicine such as anticancer agents for the pharmaceutical industry; coral is now also being used for human bone replacement.

Coral Reef Degradation in Hawaii

Natural impacts to Hawaiian coral reefs occur as a result of hurricanes and severe storms. Outbreaks of Crown-of-Thorn starfish populations that feed voraciously on coral polyps kill large parts of the reef. Coral bleaching and other coral diseases are also natural stressors on coral reefs.

Human activities also can cause significant impacts to coral populations. These activities include

- Introduction of alien species from ballast water of international cargo ships
- Removal of selected tropical fish and invertebrate species for the aquarium trade
- Commercial and recreational fishing pressures
- Marine debris, petroleum, and other toxic chemical spills
- Nutrient pollution from nonpoint source agricultural runoff or from point source discharges from sewage treatment facilities
- Sediment runoff
- Offshore dredging activities
- Marine tourism
- Urbanization of coastal areas.

See the accompanying highlight for more information on the effects of tropical fish collection.

Status of Hawaii's Coral Reefs

In *Hawaii's State of the Reefs Report* (1998), the state reported on the status of a number of environmental characteristics of Hawaii's reefs, including:

- **Water Quality** – While the status of water quality for human health effects is fairly well known, little is known about the environmental effects of water quality in coral reef areas. Increased nutrient inputs and sediment loadings are a concern. The state plans to improve monitoring in coral reef ecosystems.

- **Stony Corals** – Overall, there is no evidence of major declines due to human disturbances, although there have been some specific site effects. With impacts from activities such as illegal fish collection, coastal development, habitat disturbance, and introduction of alien species, the state plans to increase monitoring efforts and implement a number of management actions to prevent coral decline.

- **Other Corals** – Although the status of other types of coral is poorly known, there is anecdotal evidence of decline. These coral are subject to overharvesting, increased nutrient input, habitat disturbance, and coastal development. The state is considering limiting or prohibiting their collection.

- **Reef Fish** – There is anecdotal evidence that the population of reef fish are on the decline. The state plans to investigate recreational take data and revise regulations to take into account ecosystem effects of reef fishing.

- **Marine Turtles** – One species of marine turtle is in significant decline. These turtles are subject to poaching, by-catch in gill nets, and harassment. The state plans to investigate gill net rules and strengthen protection and harassment regulations.

- **Hawaiian Monk Seals** – This species is in significant decline because of harassment and death by marine debris and discarded nets. The state is working to protect the critical habitat of the monk seal.

Little is known about the status of other characteristics, such as mangroves, seagrasses, and large transient fish.

The state has documented impacts to coral reefs from coastal and urban development. For example, "hardening" of shoreline to protect private property has resulted in the loss of approximately 25 miles of beaches on O'ahu, nearly 9 miles of beaches on Maui, and an estimated 3 to 5 miles of beaches on Kaua'i. Beach loss can lead to increased turbidity and wave agitation in the shallowest waters of the back-reef habitat and depletes sand habitat for animals that live on top, in, or around the substrate.

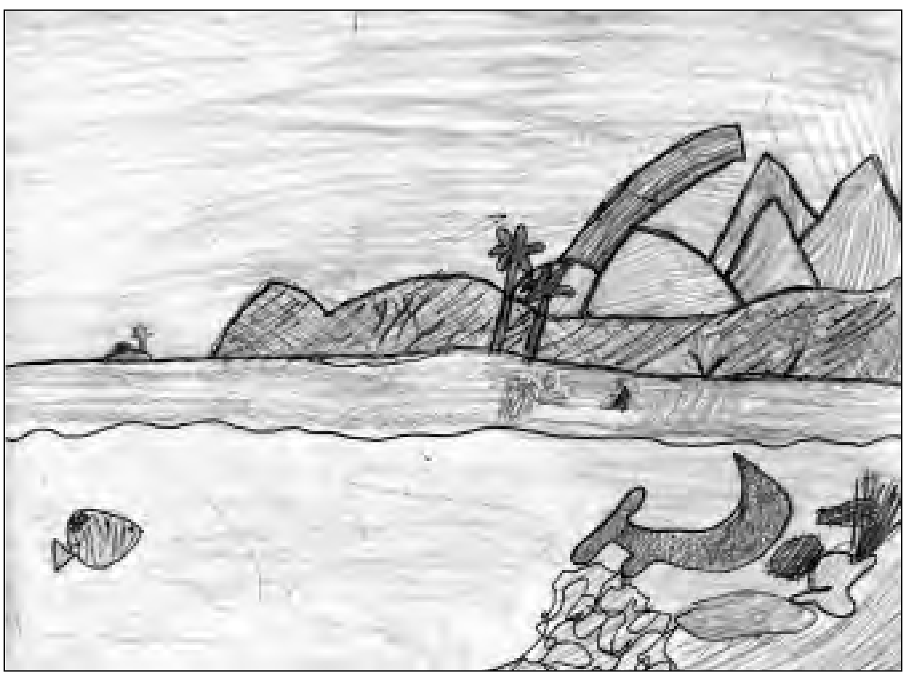
Coral Reef Management in Hawaii

One of the greatest obstacles to marine resource managers in Hawaii has been a lack of an integrated coral reef research and monitoring programs to assess changes in the health and diversity of the reefs. In response to these needs, the state developed the

Coral Reef Assessment and Monitoring Program (CRAMP) in 1998 with input from leading reef scientists and resource managers. The goal of CRAMP is to detect changes in coral reefs and increase understanding of the factors, both human and natural, that influence coral reef stability, decline, and recovery. Collaboration between the University of Hawaii Sea Grant Program, the Hawaii Department of Land and Natural Resources, the U.S. Fish and Wildlife Service Marine Ecosystem Global Partnership Program, the National Oceanic and Atmospheric Administration (NOAA), and other federal agencies helped overcome geographic barriers to conducting a statewide monitoring program in widely dispersed areas of the archipelago. CRAMP has instituted monitoring at 31 CRAMP sites throughout the islands including 21 open access area sites, six marine life conservation area sites, one natural area reserve site, and three fisheries management area sites. This integrated research and monitoring program hopefully will provide answers to help decision makers modify state laws governing activities that harm the health of coral reef communities.

Florida's Coral Reefs

About 5,000 miles east of Hawaii in the green-blue waters of the Atlantic Ocean lies a very different coral reef area—the Florida Keys. The Florida Keys extend approximately 220 miles southwest from the tip of the Florida Peninsula. Adjacent to the Florida Keys islands are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and



Jesse Xiang, Grade 3, NC

extensive living coral reefs. These reefs suffer from slightly different stresses than those in the Hawaii Islands.

Developing a Water Quality Protection Program

The Florida Keys National Marine Sanctuary and Protection Act of 1990 designated over 2,800 square nautical miles of nearshore coastal waters from Miami to the Dry Tortugas as the Florida Keys National Marine Sanctuary. Recognizing the critical role of water quality in maintaining Sanctuary resources, Congress directed EPA and the state of Florida to develop and implement a Water Quality Protection Program for the Sanctuary in cooperation with NOAA. Programs to monitor seagrass habitats, coral reefs and hard-bottom communities, and water quality were instituted with the intent of integrating biological information with water quality.

The Water Quality Protection Program was developed in two distinct phases. Phase 1 efforts included assessments of the Sanctuary's water quality, coral community, submerged and emergent aquatic vegetation, nearshore and confined waters, and spills and hazardous materials. Phase 2 focused on developing options for corrective action, developing a water quality monitoring program and associated research/special studies programs, and developing a public education and outreach program.

Florida's Coral Reef Monitoring Program

The primary goal of the monitoring project, which measures the status and trends of Florida's coral reef communities, is to assist managers in understanding, protecting, and restoring the living marine resources of the Florida Keys National Marine Sanctuary.

A Sanctuary-wide, rather than a single-location monitoring program, is necessary to detect ecosystem change in this diverse and species-rich ecosystem.

This 5-year monitoring project is documenting the status of reef habitats at 40 randomly located reef sites located within five of the nine EPA Water Quality Segments in the Florida Keys National Marine Sanctuary. Data for each successive sampling year will be compared with the prior year's data to obtain a broader understanding of the coral reef system in the Sanctuary. As coral reef monitoring is integrated with the seagrass and water quality programs, the results can be used to focus research on determining causality and can be used to inform and evaluate management decisions. This monitoring project provides the first real opportunity in the Florida Keys to address these questions at the spatial scales required to detect large-scale patterns and discriminate between hypotheses.

Ecological Problems Affecting the Sanctuary

The Sanctuary is part of a complex hydrologic/ecological system that includes the Everglades, Florida Bay, and other adjacent areas. The variety and magnitude of recent ecological problems in the Sanctuary and adjacent areas of Florida Bay indicate that existing management actions are not adequate to prevent continuing environmental degradation. The Phase 1 report outlined the following water quality concerns:

- Major environmental problems are occurring in Florida Bay including seagrass die-off, sponge die-off, mangrove decline, and algal blooms. The Bay is now in a crisis situation. Historic alterations in the quality and timing of freshwater flow from the Everglades are believed to be the major cause.

- Water quality in confined waters (e.g., dead-end canals and marinas) is deteriorating and this may be affecting biota in nearshore areas.

- Septic field leachate from onsite sewage disposal systems is degrading water quality in confined waters.

- Sewage discharge from live-aboard vessels is degrading water quality in nearshore and confined waters.

- Discharges from sewage treatment plants may be degrading nearshore water quality.

- Decomposition of weed wrack and other windblown organic debris is probably degrading water quality in some canals.

- Stormwater runoff is degrading water quality and may be degrading nearshore water quality.

- Water-temperature fluctuations, increased nutrient levels, reduced transparency, sedimentation, and contamination from oil spills, pesticides, and heavy metals may be affecting Sanctuary coral reef communities.

- Degraded water quality is probably adversely affecting submerged and emergent aquatic vegetation in the Sanctuary.

Future Monitoring and Research Activities

The Phase 2 report recommended that monitoring and research studies be conducted to collect additional data in key areas. The highest priority monitoring and research needs include

- Conducting a long-term comprehensive water quality monitoring study

- Developing models to predict the outcome of in-place and proposed water quality management strategies

- Determining what quantities of ground water nutrients are reaching Sanctuary waters

■ Assessing leachate transport into nearshore waters

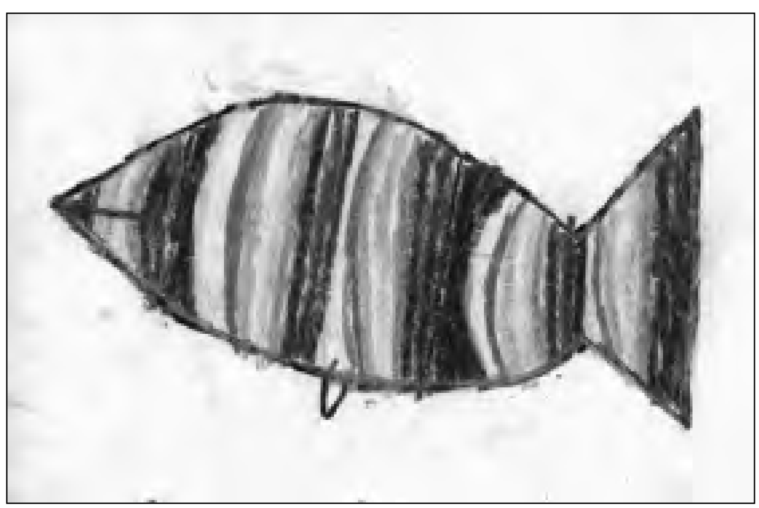
■ Conducting research to identify the causal linkages between water quality (e.g., levels of pollutants, nutrients, salinity, temperature) and ecological problems.

American Samoa's Coral Reefs

A study of the coral reefs in the National Park of American Samoa was completed in 1998. The study encompassed reefs on the northern side of Tutuila Island between Fagasa and east of Vatia at Amalua and included reefs situated along exposed coastlines and within sheltered embayments. These reefs represent a moderately diverse, healthy, and resilient assemblage of corals, invertebrates, and fishes. The coral reef and aquatic areas of the National Park of American Samoa offer many opportunities for snorkeling, diving, and aesthetic enjoyment. Humpback whales can be viewed when they visit the island during summer months.

Status of American Samoa's Coral Reefs

In general, the reefs in the National Park of American Samoa appear to be in good condition, probably because of their isolation from most human activities. Recovery from hurricane damage in 1991 was well under way at most sites in the survey, except for Fagasa, which may have experienced increased sedimentation from the construction of a major road in the watershed. There was no evidence of outbreaks of coral-eating seastars or gastropod snails in the reefs. The reef below the old Vatia dump (closed in 1995) shows no obvious signs of degradation from the former dump site with the exception of an unusual yellow film on coral reef rubble under the waterfall below the dump. Additional water quality testing is planned for this site.



Kurt Dalton, Grade 3, NC

A crystal
snowflake
falls down
on the
freezing
white
floor
of
January.

River of Words 1999 Grand Prize Winner (Poetry, Grades K-2)
Martha Bregin, Age 7, MI

River of Words 1999 Grand Prize Winner (Art, Grades 10-12)
Angela Giles, *As it Flows*, Age 18, GA

One Stressor of Hawaii's Reefs–Tropical Fish Collection

Hawaii is the major supplier of wild-caught marine aquarium fish for the international market. Reported value of all marine animals collected for the aquarium trade is $800,000 to $900,000 annually. The number of commercial permits increased by 39% between 1995 and 1998. Commercial collection conflicts with other uses of reef fish in two ways. First, some of the fish species collected when small for the aquarium trade are also caught when larger by subsistence fishers for food. Second, collectors have depleted territorial species from favored dive sites. Although the direct sale of tropical fish represents a significant economic contribution, dive and snorkel operations gross nearly five times as much in revenue annually just from the sale of dive and snorkel tours. In the past 5 years, the disputes among tropical fish collectors, subsistence fishers, and dive tour operators have intensified.

A study conducted on the Kona Coast of the Big Island of Hawaii found a significant decline in the populations of several species of target aquarium fish. Abundance of yellow tang, kole, longnosed butterflyfish, Potter's angelfish, Achille's tang, and Moorish idols declined 43%, 17%, 54%, 48%, 63%, and 56%, respectively, at the monitored locations.

Rare or solitary species that bring the highest prices in the aquarium trade are also more vulnerable to depletion because these species often have slower recruitment (replacement) rates. Many coral reef fish and invertebrates have complicated relationships to the overall ecology of the reef and their removal often affects the long-term stability of the reef. Tropical fish collection can damage coral reefs in other ways as well:

- Barrier nets used for collecting can entangle on reefs and break off portions of branching corals.
- Collectors often chase agile fish with hand or dip nets and can inadvertently damage fragile coral polyps by kicking the reef with their fins or hitting it with other diving gear.
- Many attractive tropical fish hide in branching corals when chased and some collectors break up the coral colonies to get at the fish.

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While tropical fish collection causes stress to Hawaii's coral reefs, it is by no means the only environmental stress. Other stresses to coral reefs include

- Degradation of water quality by coastal and urban development
- Point and nonpoint sources of pollution from both industry and agriculture, including sedimentation, chemical pollution, and marine debris
- Marine tourism, including snorkeling/scuba diving, reef walking, recreational fishing, recreational boating, and multi-use tour boat activities
- International shipping and oil spills, including ship groundings and sinkings
- Introduction of alien species, including algae and other marine emergent vegetation (mangroves), invertebrates, and fish.

Lisa Parsons, Grade 3, NC

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Harmful Algal Blooms

Harmful algal blooms (HABs) are best known for the problems they cause in coastal ecosystems. Large numbers of marine mammals and seabirds may suddenly die, certain fish species may become hazardous to eat, or people may develop health problems from being near some toxic blooms. Some harmful algae can discolor the water, while other blooms, which may not produce toxins, can cause a loss of oxygen, such as in the "dead zone" of the Gulf of Mexico. Still others may threaten fisheries and human health at very low concentrations that do not discolor the water at all. These microscopic organisms, so small that thousands would fit in a single drop of water, pose an increasingly frequent recurring problem for U.S. coastal communities.

The algae responsible for HABs are a very diverse group of organisms. Many of the organisms are plant-like, both single-celled varieties and large, leafy macroalgae (seaweeds). The most widely known group of algae responsible for many HABs around the world are the dinoflagellates; less common groups include diatoms (*Pseudonitzschia*), some very small flagellates (*Heterosigma*), the brown tide organisms (*Aureococcus and Aureoumbra*), and the bacteria-like blue-green algae (cyanobacteria). While most algae species are not destructive, those species that can cause harm are increasing in bloom frequency, geographic range, and bloom duration.

What Are the Impacts of Harmful Algal Blooms?

If HABs reproduce or accumulate to very high numbers, and then cells begin to die in high numbers, oxygen-poor areas develop as algal cells die and decompose. Low-oxygen waters are poor habitats for coastal fish and shellfish. Additionally, dense accumulations of these algae may cloud the water to such an extent that sunlight is blocked, inhibiting the growth of submerged aquatic grasses. Other harmful algae produce toxins that can kill fish, shellfish, marine mammals, and birds. Severe human health problems are also linked to these toxins such as tumors, nervous system effects, amnesia, and the irritation of respiratory tissues and skin. Some severe cases have resulted in death.

Red tides, caused by the dinoflagellate *Gymnodinium breve*, have caused problems on the Gulf Coast of Florida and on the East Coast since the 1500s. This alga is common in offshore waters and, following transport by ocean currents, has caused blooms from North Carolina to Mexico. The

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toxins produced by these red tides affect the nervous system and blood and can cause mass death in marine animals and respiratory irritation in humans. Blooms in the Gulf Coast of Florida have been blamed for economic losses of about $20 million per event.

Fish kills and human illness in the middle Atlantic states have recently been linked to the dinoflagellate *Pfiesteria piscicida* (Figure 1). Exposure to *Pfiesteria* toxins in the air or water at the site of an outbreak can cause skin irritation as well as short-term memory loss, confusion, and other cognitive impairments in people. However, there is no evidence that illnesses related to *Pfiesteria* are associated with eating fish or shellfish. To date, toxic *Pfiesteria* outbreaks have been associated with brackish, quiet, poorly flushed, warm water; the presence of schooling fish; and nutrient-rich waters that are thought to provide food for nontoxic populations that may transform into toxic blooms.

What Causes Harmful Algal Blooms?

Algae, harmful or otherwise, are natural components of coastal ecosystems. However, the frequency, range, and duration of HABs appears to be increasing. Some experts have attributed the global spread of HABs to introductions by ballast water from ocean-going vessels. When these vessels exchange or off-load their cargo, they frequently empty the ballast water taken on in a foreign port. If the ballast contains living cells or their dormant cysts, the receiving waters are essentially innoculated with harmful algae.

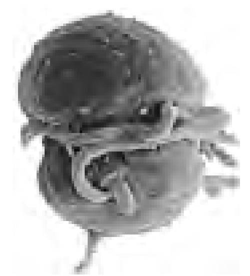

Figure 1. *Pfiesteria* piscicida.

Others have attributed the apparent increase in HAB frequency and duration to land-based sources of nutrient pollution, but nutrients act differently on the various species of harmful algae. For a few HAB species in U.S. inshore waters, such as the fish-killing species *Pfiesteria piscicida* and the amnesia-producing diatom *Pseudo-nitzschia*, there may be a direct link between nutrient loads and the expression of blooms.

Many HAB species are oceanic, such as the red tide species *Gymnodinium breve*. They grow in nutrient impoverished waters in the open ocean and can be transported to the coasts by ocean currents; thus nutrients cannot be implicated as a “cause.” However, there is evidence that the growth of the blooms may

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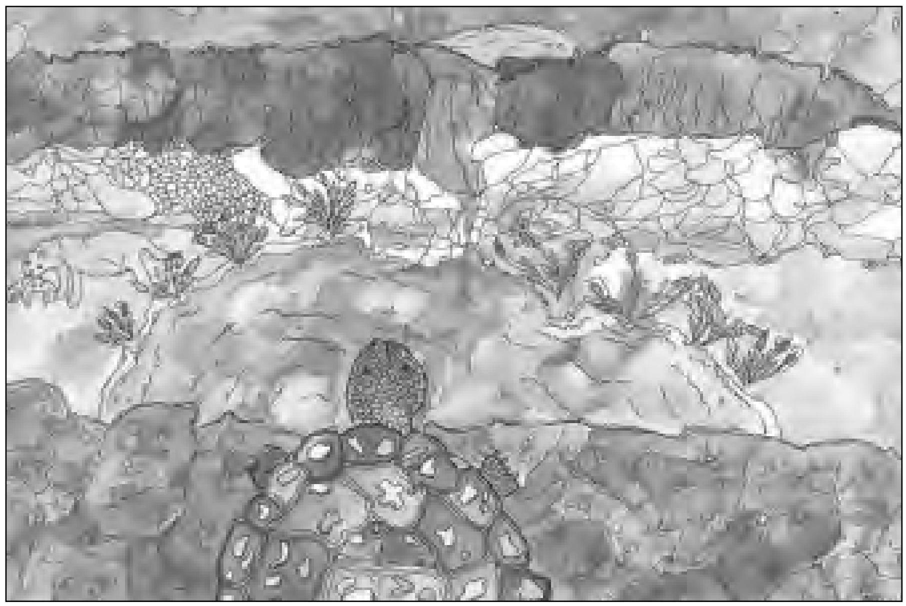
be augmented or perpetuated as a result of encountering coastal waters that have been polluted by nutrients. In other words, when the red tide organisms come into contact with nutrient-rich waters, they become "fertilized," causing rapid growth. Scientists are hypothesizing that the reduction of nutrient pollution should result in less algal growth (including HABs). While this approach will not prevent blooms completely, nutrient reduction strategies should affect the duration and spread of many harmful algal blooms.



River of Words 1999 Finalist, Arielle White, *Untitled*, Age 9, CA

1998 – The Year of the Ocean

Over half of the world's human population lives within 50 miles of a coastline. We depend on the ocean for many resources, including food, recreation, energy, and climate regulation. Because the ocean is a boundless resource for people the world over, any effective conservation efforts must be multinational in nature.

Realizing that the ocean plays a decisive role in shaping the life of this planet, the United Nations General Assembly passed a resolution declaring 1998 the Year of the Ocean.

The United States kicked off efforts with a Presidential Proclamation declaring 1998 the Year of the Ocean. Subsequently there were two federal workgroups established that identified three main goals:

- Promote awareness and understanding of the value of the sea and its resources
- Ensure the government does all it can to promote exploration, sustainable use, and conservation of the sea
- Cherish our national heritage associated with the sea.

As a result of these workgroups, federal agencies published a series of discussion papers on issues affecting ocean conservation, including transportation; tourism; national security; environmental quality and protection; and marine weather, climate, and hazards. Other activities included hosting workshops (on marine research and education, sustainable coasts, and fisheries and marine living resources management), and encouraging dialogue between industry, academics, government officials, and environmental groups.

These activities set the stage for the National Ocean Conference, which took place June 11-12, 1998, in Monterey, California. At the conference, President Clinton and Vice President Gore launched a series of initiatives to explore, protect, and restore the nation's ocean resources. The President also charged his cabinet to develop recommendations for a coordinated, disciplined, long-term federal oceans policy in a year.

The Oceans: An Agenda for Action

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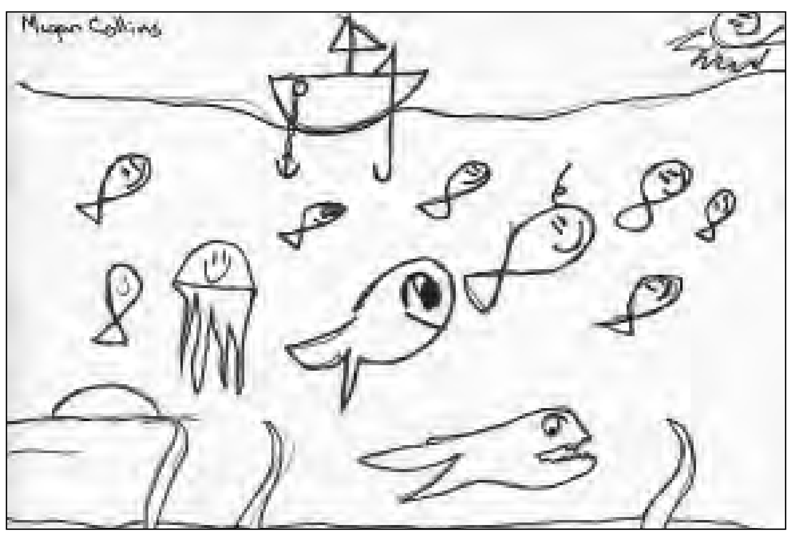
outlines 10 ocean initiatives that the United States shall engage in to protect and enhance the use of ocean resources:

- **Protecting our Oceans from Offshore Oil Drilling** – A 10-year extension of the offshore leasing moratorium; a permanent ban on leasing in national marine sanctuaries.
- **Building Sustainable Fisheries** – A ban on the sale or import of undersized Atlantic swordfish.
- **Ports for the 21st Century** – Funds for dredging shipping channels.
- **Law of the Sea Convention** – The President called on the Senate to ratify U.S. accession to the convention.
- **Protecting Coral Reefs** – Executive order directing federal agencies to expand research, preservation, and restoration activities for the protection of natural corals in the United States.
- **Exploring the Last U.S. Frontier** – Initiatives to increase research and monitoring efforts.
- **Protecting our Beaches and Coastal Waters** – Clean Water Action Plan.
- **Monitoring Climate and Global Warming**.
- **Public Access to Military Data and Technology**.

To learn more about the U.S. involvement in the Year of the Ocean, visit EPA's website at *http://www.epa.gov/OWOW/oceans/yoto/*.



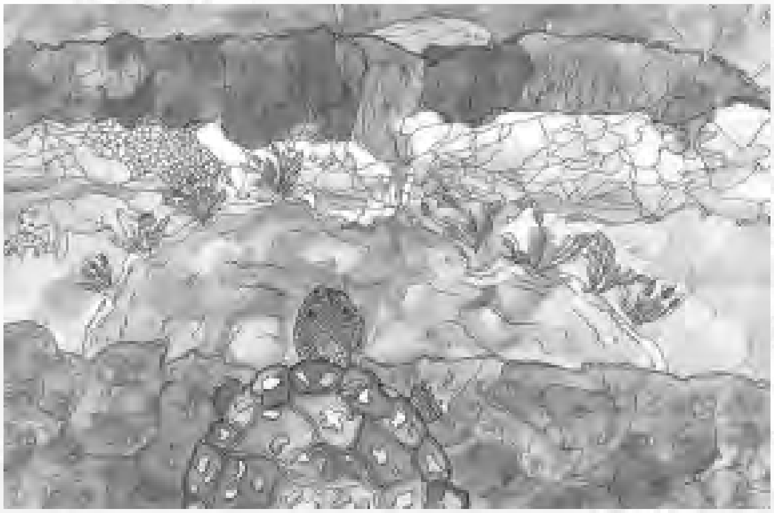
Megan Collins, Grade 3, NC

Obstruction

Winds blowing, rivers flowing,
Birds chirping, animal slurping
From the river, big gulps
Quench their thirst.
The water glistens in the sun.

Twigs breaking, people raking
Leaves falling, dams stalling.
A wall is there, stopping
And holding
The river from flowing and going to its home.

River of Words 1998 Dam Fighter Award
Rachel Prieto, Age 16, MI



Arielle White, Age 9, *Untitled*, CA


Sharon Davis, Bear Island, NC

Wetlands

Introduction

Wetlands are the link between land and water (Figure 6-1). Wetlands generally include swamps, marshes, bogs, fens, prairie potholes, seeps, vernal pools, pocosins, and similar areas. Most people can easily identify some kinds of wetlands, such as marshes, as being wetlands. However, other kinds of wetlands are not as easily identified because they may not be flooded and are often dry during part of the year.

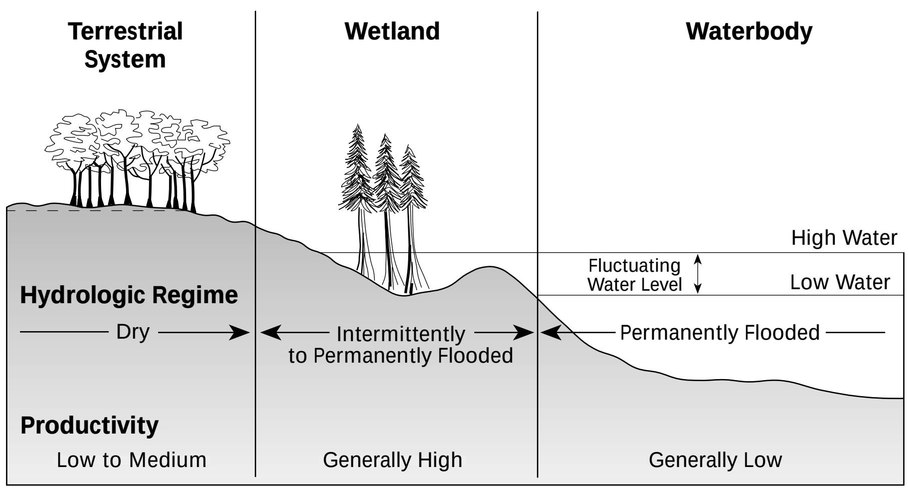
All wetlands, however, are flooded or have water just below the ground surface long enough during the growing season to develop oxygen-poor soils. This is important because almost all animals and plants use oxygen to convert sugar, protein, and other organic molecules into the energy necessary to grow and survive. Normally, when bacteria and microbes in the soil decompose dead plants and animals, the oxygen that they use is replaced from the air. However, oxygen moves through the water about ten thousand times slower than the air. When a wetland or "hydric" soil is saturated or flooded, the oxygen used by the bacteria and microbes is not replaced fast enough. As a result, most plants cannot grow there because they do not have enough oxygen for their roots. Wetland plants, such as cattails and water lilies, have special adaptations to temporarily survive without oxygen in their roots or to transfer oxygen from the leaves or stem to the roots.

A wide variety of wetlands exist across the country because of regional and local differences in hydrology, vegetation, water chemistry, soils, topography, climate, and other factors. Wetland type is determined primarily by local hydrology, the unique pattern of water flow through an area. In general, there are two broad categories of wetlands: coastal and inland.

With the exception of the coastal wetlands of the Great Lakes, coastal wetlands are closely linked

Figure 6-1

Depiction of Wetlands Adjacent to Waterbody



Wetlands are often found at the interface between dry terrestrial ecosystems, such as upland forests and grasslands, and permanently wet aquatic ecosystems, such as lakes, rivers, bays, estuaries, and oceans.

Reprinted with modifications, by permission, from Mitsch/Gosselink: *Wetlands 1986*, fig. 1-4, p. 10. ♦1986, Van Nostrand Reinhold.

to estuaries. In these estuarine systems, sea water mixes with fresh water to form an environment of varying salinity and temperature. Tides and wind also cause the water levels to fluctuate. Coastal marshes dominated by grasses, sedges, rushes, and halophytic (salt-loving) plants are generally located along the Atlantic and Gulf coasts due to the gradual slope of the land. Mangrove swamps, which are dominated by halophytic shrubs and trees, are common in Hawaii, Puerto Rico, Louisiana, and southern Florida.

Inland wetlands are most common on floodplains along rivers and streams, in isolated depressions surrounded by dry land, and along the margins of lakes and ponds. Inland wetlands include marshes and wet meadows dominated by grasses, sedges, rushes, and herbs; shrub swamps; and wooded swamps dominated by trees, such as hardwood forests along floodplains. Some regional wetland types include the pocosins of North Carolina, bogs and fens of the northeastern and north central states and Alaska, inland saline and alkaline marshes and riparian wetlands of the arid and semiarid West, vernal pools of California, playa lakes of the Southwest, cypress gum swamps of the South, wet tundra of Alaska, the South Florida Everglades, and prairie potholes of Minnesota, Iowa, and the Dakotas.

Functions and Values of Wetlands

In their natural condition, wetlands provide essential ecological processes called functions, which are beneficial not only to wetlands but also to their surrounding ecosystems and people. Wetland functions can be grouped into several broad categories:

- Storage of water
- Storage of sediment and nutrients
- Growth and reproduction of plants and animals
- Diversity of plants and animals.

The location of a wetland in a watershed and the size of a wetland help determine what functions it will perform. Not all wetlands perform all functions nor do they perform all functions at equivalent levels. For example, some wetlands naturally have greater capacity to store water because of their landscape position. Many other factors can influence how well a wetland will perform these functions, including weather conditions, quantity and quality of water entering a wetland, and human alteration of a wetland or surrounding landscape.

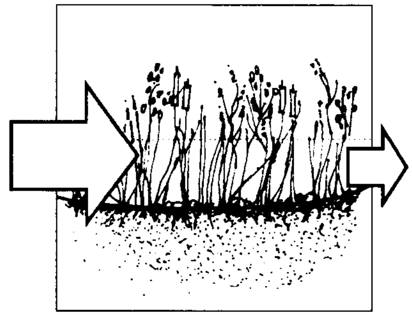
Storage and Filtering of Water

The historic loss of wetlands in the Midwest was a significant factor contributing to the severe flooding in the Upper Mississippi and Missouri River Basins in the summer of 1993. Wetlands help prevent floods by storing and slowing the flow of water through a watershed. Many wetlands act like natural basins and hold water from rain storms, overland flow, and from flooding rivers. As water passes through a wetland, it is also slowed by the wetland's plants (Figure 6-2). Through the combined effects of retaining and slowing water, wetlands allow water to percolate through the soil into the ground water and slowly move through the watershed (Figure 6-3). In watersheds that have lost most of their wetlands, the rainfall flows quickly into streams and rivers and overloads their capacity to transport water through the watershed. The graph in Figure 6-4 shows the flow of water in two streams in Massachusetts. One stream does not have many wetlands left in the watershed and has a steep hydrograph. The other stream has a lot of wetlands left in the watershed and has a more stable hydrograph. Increasing the amount of pavement in a watershed can cause similar problems. The result is that streams and rivers flood and damage homes, farms, and businesses. In addition, streams and rivers are severely damaged as their banks erode and their channels become flatter and deeper. Downstream lakes and estuaries are also damaged by the large influx of silt in mud that makes the water cloudy, buries plants and animals, and prevents underwater plants from getting the light they need.

Floods continue to seriously damage the property and threaten the livelihood of thousands of Americans despite expenditures of billions of local, state, and federal dollars over the years to reduce flooding. Loss or degradation of wetlands indirectly intensifies flooding by eliminating their capacity to absorb peak flows and gradually release flood waters. Following are several examples of the monetary cost of wetland loss.

Figure 6-2

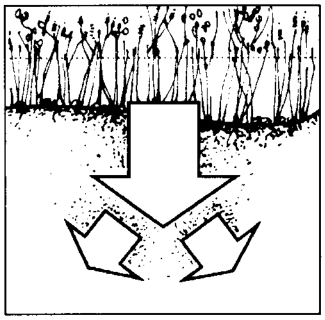
Flood Protection Functions in Wetlands



Source: Washington State Department of Ecology.

Figure 6-3

Ground Water Recharge Functions in Wetlands



Source: Washington State Department of Ecology.

Figure 6-4

Streamflow Through Wetlands

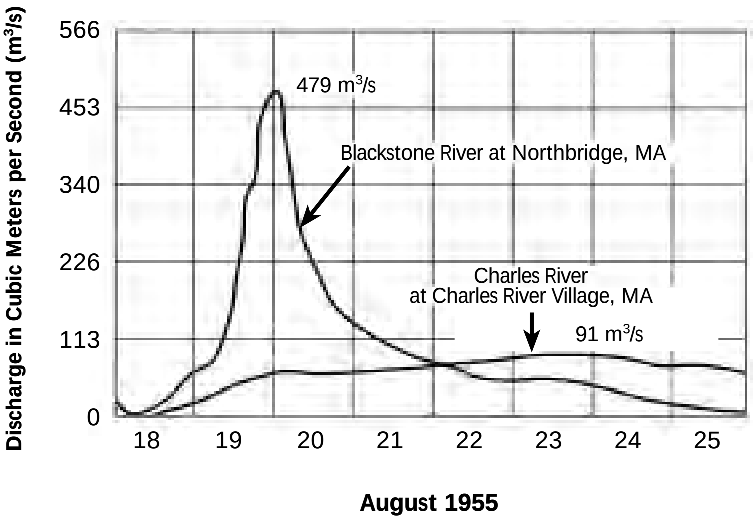
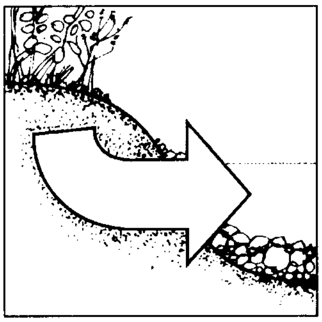


Figure 6-5

Streamflow Maintenance Functions in Wetlands



Source: Washington State Department of Ecology.

■ In Massachusetts, the U.S. Army Corps of Engineers estimated that over $17 million of annual flood damage would result from the destruction of 8,422 acres of wetlands in the Charles River Basin. For this reason, the Corps decided to preserve wetlands rather than construct extensive flood control facilities along a stretch of the Charles River near Boston. Annual benefits of the preservation project average $2.1 million and annual costs average $617,000.

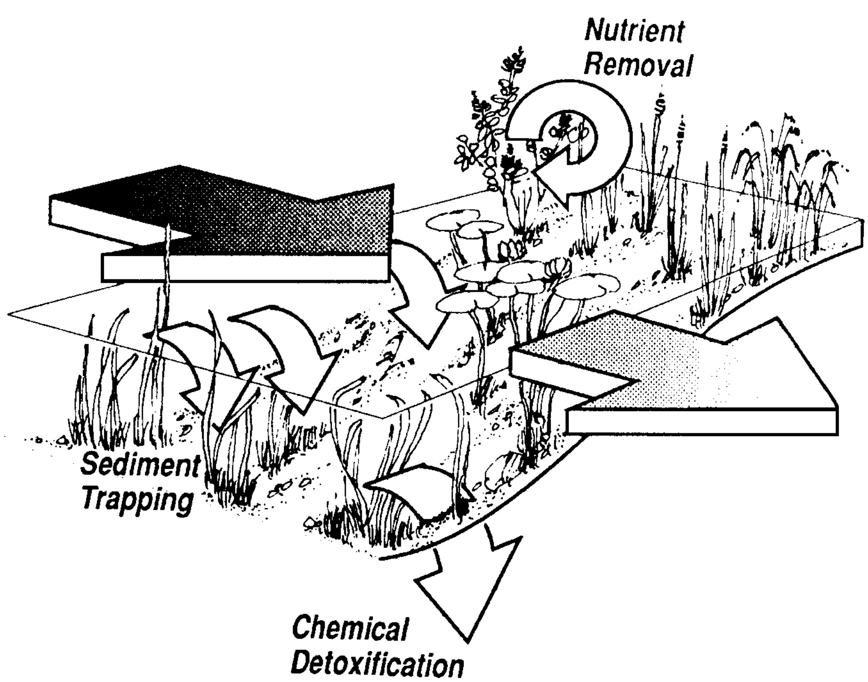
■ The Minnesota Department of Natural Resources estimated that it costs the public $300 to replace the water storage capacity lost by development of 1 acre of wetlands that holds 12 inches of water. The cost of replacing 5,000 acres of wetlands would be $1.5 million, which exceeds the state's annual appropriation for flood control.

■ In 1988, DuPage County, Illinois, found that 80% of all flood damage reports came from homebuilders whose homes were built on converted wetlands. The county spent $0.5 million to $1.0 million annually to correct the problem.

Restoring wetlands in a watershed can help prevent the amount and severity of flooding. Restoring wetlands can also improve the flow of water during dry seasons by allowing water to percolate into the ground water and gradually enter a stream rather than having rapid runoff (Figure 6-5). Water entering wetlands during wet periods is released slowly through ground water, thereby moderating stream flow volumes necessary for the survival of fish, wildlife, and plants that rely on the stream.

Figure 6-6

Water Quality Improvement Functions in Wetlands



Source: Washington State Department of Ecology.

Storage of Sediment and Nutrients

Wetlands act like filters that purify water in a watershed. Often the water leaving a wetland is much cleaner than the water that entered the wetland. When water is slowed or stored in a wetland, much of the sediment settles out and remains in the wetland (Figure 6-6). Thus, the water leaves a wetland less cloudy. Wetlands also trap nutrients that are attached to the sediment or dissolved in water. Nutrients are either stored in the wetland soil or are used by plants to grow.

Wetlands on the fringes of lakes and estuaries keep the larger waters clean by trapping sediment and preventing shoreline erosion. Marsh plants help dissipate wave energy and their extensive root networks anchor the marsh (Figure 6-7). Without the plants, the waves would eat away at the shore and cause extensive erosion. Marsh plants also slow the movement of water, allowing sediment and nutrients to settle and remain in the marsh. Wetland loss and degradation reduce water quality purification functions performed by wetlands.

The following examples show the value of the capacity of wetlands to store sediment and nutrients.

■ The Congaree Bottomland Hardwood Swamp in South Carolina provides valuable water quality services, such as removing and stabilizing sediment, nutrients, and toxic contaminants. The total cost of constructing, operating, and maintaining a tertiary treatment plant to perform the same functions would be $5 million.

■ Forested riparian wetlands play an important role in reducing nutrient loads entering the Chesapeake Bay. In one study, a riparian forest in a predominantly agricultural watershed removed about 80% of the phosphorus and 89% of the nitrogen from the runoff water before it entered a tributary to the Bay. Destruction of such areas adversely affects the water quality of the Bay by increasing undesirable weed growth and algae blooms.

■ A study of two similar sites on the Hackensack River in New Jersey showed the amount of erosion that often results from the destruction of marshlands. In the study, marsh vegetation was cut at one site and left undisturbed at the other site. The river bank at the cut site eroded nearly 2 meters (more than 6 feet) in 1 year while the uncut site had very little bank erosion.

These examples illustrate the integral role of wetlands in our ecosystems and how wetland destruction and degradation can have expensive and permanent consequences. Preserving wetlands and their functions will ensure that wetlands continue to provide many benefits to people and the environment.

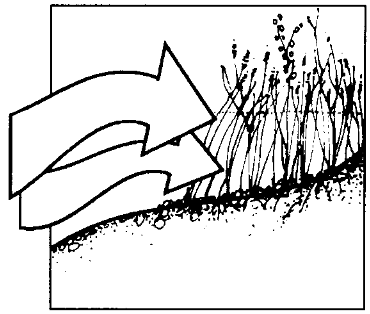
Growth and Reproduction of Plants and Animals

Some wetlands, such as salt marshes, are among the most productive natural ecosystems in the world. Only rain forests and coral reefs come close to matching their productivity. They produce huge amounts of plant leaves and stems that serve as the basis of the food web. When the plants die, they decompose in the water and form detritus (Figure 6-8). Detritus and the algae that often grow on plants are the principal foods for shrimp, crabs, clams, and small fish, which, in turn, are food for larger commercial and recreational fish species such as bluefish and striped bass.

Wetlands produce a wealth of natural products, including fish and shellfish, timber, wildlife, and wild

Figure 6-7

Shoreline Stabilization Functions in Wetlands



Source: Washington State Department of Ecology.

rice. Around 95% of the fish and shellfish species commercially harvested in the United States are dependent on wetlands during some stage of their life. A national survey conducted by the U.S. Fish and Wildlife Service in 1991 illustrates the economic value of some of the wetland-dependent products. Over 9 billion pounds of fish and shellfish landed in the United States in 1991 had a direct, dockside value of $3.3 billion. This served as the basis of a seafood processing and sales industry that generated total expenditures of $26.8 billion. In addition, 35.6 million anglers spent $24 billion on freshwater and saltwater fishing.

Diversity of Plants and Animals

Wetlands are critical to the survival of a wide variety of animals and plants, including numerous rare and endangered species. Wetlands are also primary habitats for many species, such as the wood duck, muskrat, and swamp rose. For others, wetlands provide important seasonal habitats where food, water, and cover are plentiful.

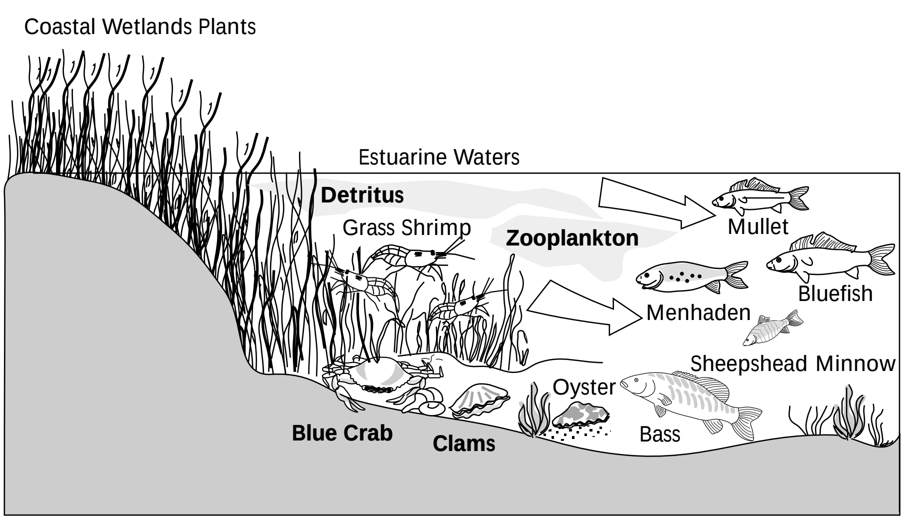
The Arizona Game and Fish Department estimates that 75% or more of all Arizona's native wildlife species depend on healthy wetlands and riparian systems during some portion of their life cycle.

The abundant wildlife in wetlands also attracts outdoor recreationists. Outdoor recreationists attracted to national wildlife refuges (NWR), which often protect extensive wetlands, bring millions of dollars and many jobs to adjacent communities. The Fish and Wildlife Service estimated that, in 1994, bird watchers and other outdoor recreationists spent $636,000 in the communities around the Quivara NWR in Kansas, $3.1 million around the Salton Sea NWR in California, and over $14 million around the Santa Ana NWR in Texas.

When wetlands are removed from a landscape or are damaged by human activities, there is a decline in the biological health of a watershed. Many species of plants and animals decline in number. As shown by the alarming amount of amphibian deformities in the Great Lakes and New England regions, many animals suffer from deformities and reproductive failure. Some, such as the Ivory-billed Woodpecker and Dusky Seaside Sparrow, become extinct. The Nature Conservancy estimates that two-thirds of freshwater mussels and crayfishes are rare or imperiled and more than one-third of freshwater fishes and

Figure 6-8

Coastal Wetlands Produce Detritus that Support Fish and Shellfish



amphibians dependent on aquatic and wetland habitats are at risk (Figure 6-9). Forty-six percent of the threatened and endangered species listed by the U.S. Fish and Wildlife Service rely directly or indirectly on wetlands for their survival (Table 6-1).

Extent of the Resource

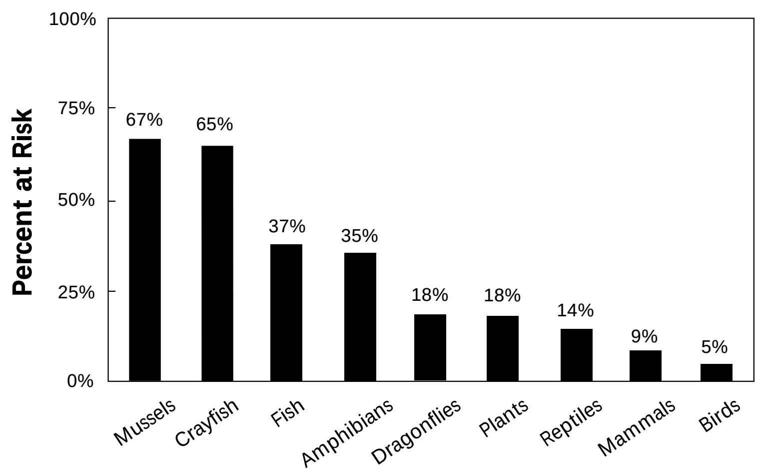
Wetland Loss in the United States

It is estimated that more than 200 million acres of wetlands existed in the lower 48 states at the time of European settlement. Since then, extensive wetland acreage has been lost. Many of our original wetlands have been drained and converted to farmland and urban development. Today, less than half of our original wetlands remain. When added together, the total amount of wetland loss is greater than the size of California (see Figure 6-10). According to the U.S. Fish and Wildlife Service's *Wetlands Losses in the United States 1780s to 1980s*, the three states that have sustained the greatest percentage of wetland loss are California (91%), Ohio (90%), and Iowa (89%).

The average annual loss of wetlands has decreased over the past 40 years. The U.S. Fish and Wildlife Service's reports on the status and trends of wetlands estimate average annual losses of 458,000 acres of wetlands from the mid-1950s to the mid-1970s and average annual losses of 290,000 acres between the mid-1970s and mid-1980s. Recent federal studies lead to an average annual net loss of wetlands

Figure 6-9

Aquatic and Wetland Species at Risk



Source: The Nature Conservancy and State Natural Heritage Data Centers, 1996.

Table 6-1. Summary of Threatened and Endangered Species That Are "Wetland-Associated"

Category	Number of U.S. Endangered and Threatened Species as of May 31, 1997, that are Wetland-Associated or Dependent	Total Number of U.S. Endangered and Threatened Species as of May 31, 1997	Percent of Total
Mammals	42	63	66.7
Birds	72	89	80.9
Reptiles	21	33	63.6
Amphibians	15	15	100
Fishes	107	107	100
Snails	10	22	45.5
Clams	62	62	100
Crustaceans	18	18	100
Insects	9	33	27.3
Arachnids	0	5	0
Plants	143	635	22.5
Totals	**499**	**1,082**	**46.1**

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New England Biological Assessment of Wetlands Work Group

The New England Biological Assessment of Wetlands Work Group (NEBAWWG, pronounced "Nee-bog") was formed in June 1998 to develop and improve existing programs for assessing the biological health of wetlands in the New England region. NEBAWWG includes representatives from each of the New England states, various federal agencies, universities, and nongovernment organizations. NEBAWWG has three main objectives:

- Develop and institutionalize a region-wide biomonitoring network for wetlands
- Oversee state pilot projects and address logistical and technical issues
- Coordinate with and complement the efforts of other biomonitoring groups and interested parties.

Workshops and Training Sessions

The first NEBAWWG workshop, held in October 1998, provided field demonstrations, an overview of national bioassessment efforts, and a discussion of planned New England pilot projects. NEBAWWG will host a series of technical training sessions with field components. Topics to be addressed include:

- Classifying wetlands
- Selecting reference wetlands
- Sampling methods for different assemblages (e.g., macroinvertebrates, plants)
- Data analysis, including selecting metrics and developing an index of biological integrity (IBI)
- Managing, storing, and communicating data and information.

State Pilot Projects

NEBAWWG has started three state pilot projects in Maine, Massachusetts, and Vermont.

Maine

The Maine Department of Environmental Protection (ME DEP) started its preliminary field work in the summer of 1998. The objectives of the project are to develop biological sampling protocols for nontidal wetlands, measure wetlands attributes across a gradient of human disturbance in a pilot watershed, and identify candidate metrics/indicators of biological integrity on a watershed basis. The Casco Bay watershed, located in southern Maine, was selected as the

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study area because it is experiencing high levels of development pressure and consequent impacts to wetlands. The Casco Bay watershed contains a broad range of wetland types and conditions, ranging from relatively undisturbed wetlands to wetlands that are severely damaged. During 1999 and 2000, ME DEP intends to develop sampling methods and identify candidate metrics for the macroinvertebrate, algae, and plant assemblages.

Massachusetts

Since July 1995, Massachusetts Coastal Zone Management (MA CZM) has been engaged in a regional research and demonstration project, called the Coastal Wetland Ecosystem Protection Project. The goal of the project is to develop, test, and refine a transferable approach to evaluating the condition of both salt and freshwater marshes using plants and macroinvertebrates. MA CZM is developing the bioassessment methods to determine the impacts of adjacent land uses and nonpoint sources of pollution on the ecological integrity of these aquatic resources. A product of the Coastal Wetland Ecosystem Protection Project is the publication, *Wetland Ecological Integrity: An Assessment Approach*, which was published in 1998. This included development of the *Wetland Health Assessment Toolbox*, which can be accessed on the Internet at *http://www.magnet.state.ma.us/czm/what.htm*. The current pilot project will refine the existing wetland ecological assessment approach, protocols, and metrics. MA CZM also intends to broaden and field test the assessment approach in other wetland types and conditions.

Vermont

The Vermont Department of Environmental Conservation (VT DEC) and the Vermont Nongame and Natural Heritage Program (VT NNHP) will jointly develop and implement biological assessment programs for vernal pools and northern white cedar swamps. The primary objectives of the first year are to

- Evaluate existing information
- Identify and classify the vernal pools and northern white cedar swamps based on physical, chemical, and biological characteristics
- Identify candidate metrics of biological integrity
- Develop and evaluate sampling protocols.

STATES REPORT that agriculture, road construction, and residential development and urban growth are the leading sources of recent wetland loss.

around 100,000 acres per year in the contiguous United States.

Although losses continue to decline, we still have to make progress toward the Clean Water Action Plan goal of annual net gain of 100,000 acres per year by the year 2005 and every year thereafter (see highlight on page 152). In addition, we need to be mindful of the long-term Administration goal of increasing the quality of the nation's wetland resource base.

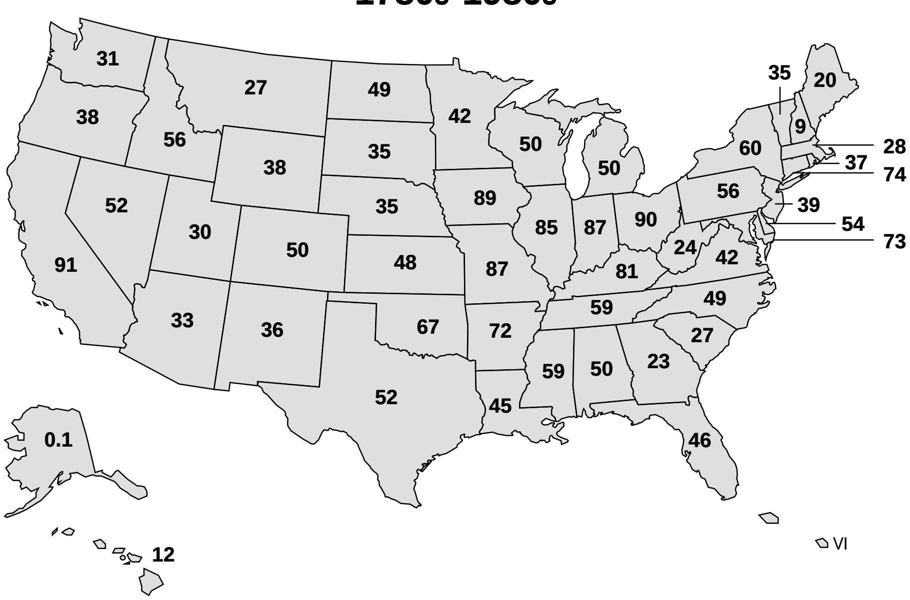
The decline in wetland losses is a result of the combined effect of several trends:

- The decline in profitability in converting wetlands for agricultural production
- Passage of Swampbuster in the 1985 and 1990 Farm Bills
- Presence of the CWA Section 404 permit programs as well as development of state management programs
- Greater public interest and support for wetland protection
- Implementation of wetland restoration programs at the federal, state, and local level.

Limited conclusions can be drawn about sources of recent wetlands loss because only eleven states and tribes listed this information in their 1998 305(b) reports (Figure 6-11). These states and tribes cited agriculture as the leading source of current losses (see Appendix D, Table D-1, for individual state information). Other losses were due to residential growth and urban development; construction of roads, highways, and bridges; filling and/or draining; construction; industrial development; hydrologic modification; commercial development; and channelization.

Figure 6-10

Percentage of Wetland Acreage Lost, 1780s-1980s



Twenty-two States have lost at least 50% of their original wetlands. Seven of these 22 (California, Indiana, Illinois, Iowa, Missouri, Kentucky, and Ohio) have lost more than 80% of their original wetlands.

Source: Dahl, T.E., 1990, *Wetlands Losses in the United States 1780's to 1980's*, U.S. Department of the Interior, Fish and Wildlife Service.

Designated Use Support in Wetlands

The states, tribes, and other jurisdictions are making progress in incorporating wetlands into water quality standards and developing designated uses and criteria specifically for wetlands. But many states and tribes still lack wetland-specific designated uses, criteria, and monitoring programs for wetlands. Without criteria and monitoring data, most states and tribes cannot evaluate attainment of water quality standards. To date, only 11 states and tribes reported the designated use support status for some of their wetlands (see Appendix D, Table D-1). Only three states used monitoring data as a basis for attainment of water quality standards.

- California reported that 11% of the 138,208 acres of assessed wetlands fully support all uses and 88% are impaired for one or more uses. Causes of impairment include metals, nutrients, salinity/total dissolved solids/chlorides, flow alterations, and other habitat alterations. Sources impacting wetlands include agriculture, urban runoff and storm sewers, and hydrologic modifications.

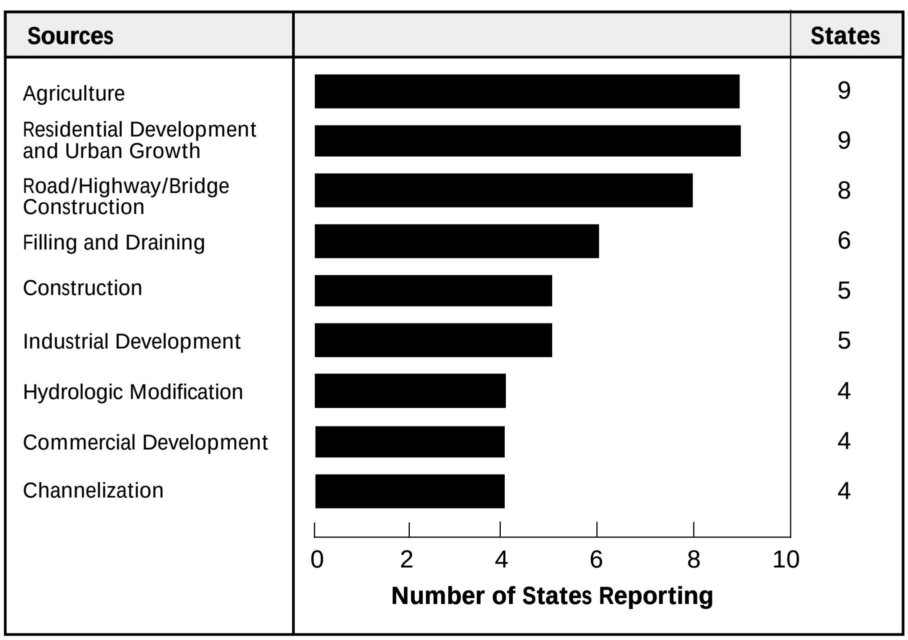
- Iowa used best professional judgment to determine the use support status of 33,221 wetland acres during 1996 and 1997. The state reported that 6% of assessed wetland acres fully support all uses, 38% fully support all uses but are threatened for at least one use, and 57% are impaired for one or more uses. Impairment is due to nutrients, siltation, flow alterations, noxious aquatic plants, and exotic species. Sources of impairment include agriculture and hydrologic and habitat modifications.

- Kansas assessed 35,607 wetland acres for the current reporting cycle, of which 25,069 were monitored and an additional 10,538 were evaluated. The state reported that, for aquatic life use support (acute criteria only), 29% of assessed wetland acres are fully supporting but threatened,

Figure 6-11

Sources of Recent Wetland Losses

(11 States Reporting)

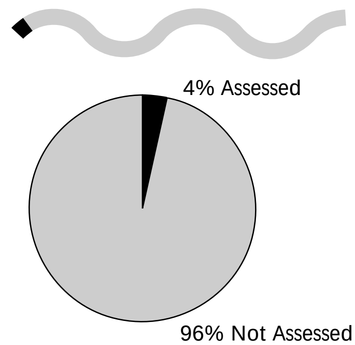


Based on data contained in Appendix D, Table D-4.

Wetland Acres Assessed by States and Tribes

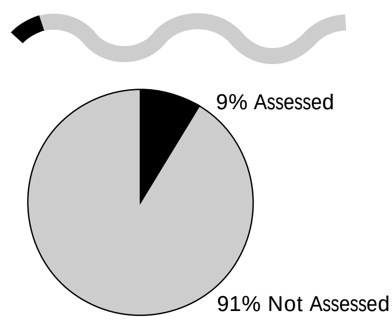
Including Alaska's Wetlands

■ 9,831,988 acres = 4% assessed
■ Total acres (including Alaska) = 274 million[a]



Excluding Alaska's Wetlands

■ 9,831,988 acres = 9% assessed
■ Total acres (excluding Alaska) = 107 million



[a]From Dahl, T.E. 1990. *Wetlands Losses in the United States 1780's to 1980's*. U.S. Department of the Interior, Fish and Wildlife Service.

Source: 1998 Section 305(b) reports submitted by states, tribes, territories, and commissions.

More states are monitoring unimpacted wetlands to define baseline conditions in healthy wetlands.

5% are partially supporting, and 66% are not supporting this use. Major causes of impairment are nutrients, flow alterations, low dissolved oxygen, and turbidity/siltation. Major sources of impairment were agriculture, hydrologic modifications, and natural processes such as climate variations.

■ Kentucky reported that 973,168 wetland acres are threatened due to the pressure of development. This acreage includes all wetlands in the state not in public ownership or under some form of protection. The estimate is based on National Wetlands Inventory maps.

■ Louisiana assessed aquatic life use support in nearly 700,000 acres of its 8.1 million total acres of wetlands. Over 99% of these acres are impaired because of either mercury or organic enrichment/low dissolved oxygen. The state reported unknown sources and atmospheric deposition as sources of impairment.

■ Michigan reported on one wetland 10 acres in size. This wetland was impaired for aquatic life use in the past, but has now been remediated and fully supports this use. The improvement is due to a reduction in nickel contamination by an upstream point source discharge.

■ Nevada used best professional judgment to assess 21,326 acres (16%) of its 136,650 total acres of wetlands. The state reported that all of the assessed wetlands fully support designated uses.

■ North Carolina used aerial photographs and soil information from a 1992-1993 survey to rate use support by current land use. North Carolina rated wetlands on hydric soils with natural tree cover as fully supporting uses. Partially supporting wetlands have modified cover and hydrology but still retain wetland status and support most uses. For example, pine plantations still retain value for wildlife habitat, flood control, ground water recharge, nutrient removal, and aquatic habitat, although the modified wetlands support these uses less effectively than undisturbed wetlands. Wetlands converted to agriculture or urban land use are classified as not supporting original wetland uses. The state used this methodology to assess use support in over 7 million acres of wetlands. The state reported that 66% of the assessed wetlands fully support uses and 34% are impaired for one or more uses.

■ Tennessee used evaluative data to assess 787,000 wetland acres. Of the assessed acres, 93% fully support all designated uses. The state reported that siltation, flow and habitat alterations, and priority organic chemicals impair the remaining acres. Sources of impairment include agriculture, hydromodification, filling and draining, development, ground water loadings, and construction.

■ The U.S. Virgin Islands used evaluative data to assess 927 wetland acres. More than 99% of these acres fully support all designated use. Impairment to 1 acre is due to sediment, bacteria, and low dissolved oxygen associated with urban runoff, municipal point sources, and spills.

■ The Coyote Valley Tribe used evaluative data to assess 1.6 wetland acres, all of which are impaired for one or more uses. This impairment is associated with siltation, habitat and flow alterations, weeds, and exotic species. The tribe identified agriculture, development, public projects, and municipal point sources as sources of impairment.

EPA can draw only limited conclusions about water quality in wetlands because the states used different methodologies to survey only 4% of the total wetlands in the nation, and because 73% of the assessed wetland acreage is in one state alone (North Carolina). More states and tribes will assess use support in wetlands in the future as they develop standards for wetlands. Many states are still in the process of developing wetland water quality standards, which provide the baseline for determining beneficial use support (see Chapter 2). Improved standards will also provide a firmer foundation for assessing impairments in wetlands in those states already reporting use support in wetlands.

Monitoring Wetland Health

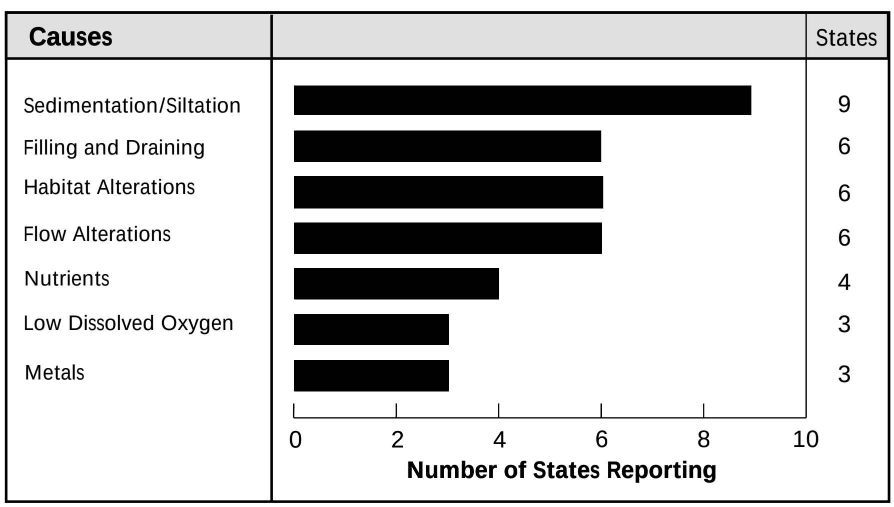
More than 25 years after it was passed, the Clean Water Act still challenges us to answer critical questions about the physical, chemical, and biological condition of the nation's waters. While great strides have been made to develop and implement methods to evaluate the condition of streams and lakes, research on wetlands has lagged behind. Considering that states and tribes collectively reported the quality of only 4% of the nation's wetlands, the nation needs an effective means to measure wetland health.

Currently, states and tribes have insufficient data to evaluate the health of wetlands or quantify the extent of pollutants degrading wetlands and the sources of these pollutants. Although most states cannot quantify the wetland area impacted by individual causes and sources of degradation, 11 states and tribes identified causes and 10 states and tribes identified sources known to degrade wetland integrity to some extent (Figures 6-12 and 6-13). These states listed sediment as the most widespread cause of degradation impacting wetlands, followed by draining, habitat alterations, and flow

More information on wetlands can be obtained from EPA's Wetlands Hotline at 1-800-832-7828, 9 a.m. to 5 p.m. Eastern Standard Time.

Figure 6-12

Causes Degrading Wetland Integrity
(11 States Reporting)



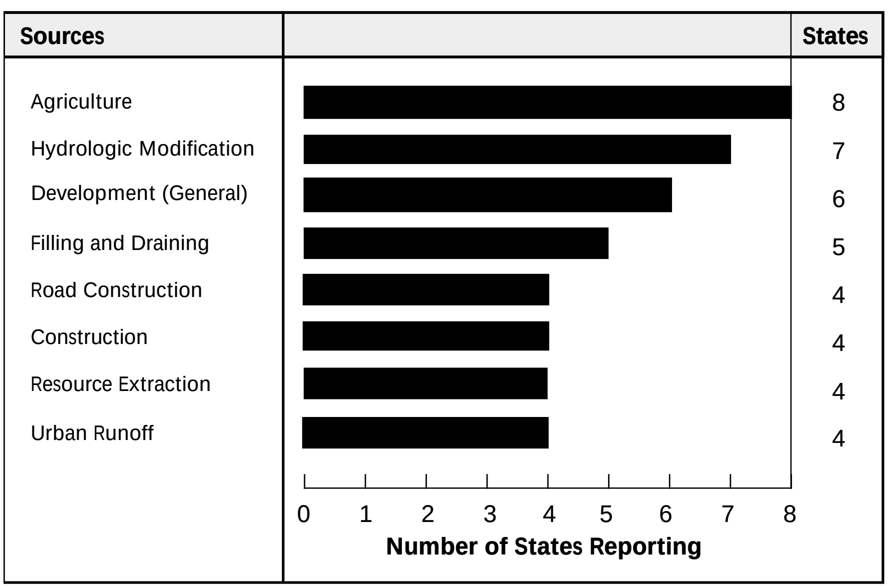
Based on data contained in Appendix D, Table D-2.

alterations. Agriculture and hydrologic modifications topped the list of sources degrading wetlands, followed by development and draining (see Appendix D, Tables D-2 and D-3, for individual state information).

As states and tribes incorporate wetlands into water quality standards and adopt wetland-specific uses and criteria, monitoring programs will become increasingly important to determine if wetlands are meeting their existing and designated uses. Monitoring programs are also needed to prioritize wetlands for protection and restoration and to develop performance standards for successful mitigation and restoration efforts. Several states are developing biological

Figure 6-13

Sources Degrading Wetland Integrity
(10 States Reporting)



Based on data contained in Appendix D, Table D-3.

assessment methods to evaluate the health of wetlands, designate uses for aquatic life, develop biological criteria, and determine if they are supporting aquatic life uses.

- Minnesota has developed a Wetland Index of Biological Integrity (WIBI) using macroinvertebrates and a Wetland Index of Vegetative Integrity (WIVI) using plants for depressional wetlands. Minnesota plans to use these tools to evaluate the biological integrity and aquatic life use support of depressional wetlands. They are also partnering with local governments to train volunteers to use simpler versions of these methods to evaluate the condition of wetlands.

- Montana is developing biological assessment methods for wetlands using macroinvertebrates and algae. To partition natural variability between wetland types, Montana developed a classification system to group reference wetlands by ecoregion and then by wetland type. Preliminary results indicate detection of impairments caused by metals, nutrients, salinity, sediment, and fluctuating water levels.

- North Dakota started its pilot project in 1993. They are developing bioassessment methods for depressional wetlands that are temporarily or seasonally flooded. They have developed a preliminary index of biological integrity for the plant community.

■ Ohio started a pilot project in 1994 to develop biological criteria for wetlands. Ohio is applying the same approach to wetlands that it used to develop its stream biological criteria program. Methodologies to assess vegetation, macroinvertebrates, and amphibian assemblages are under development. Ohio has developed a Floristic Quality Assessment Index to evaluate the condition of the plant community.

■ In 1999, Maine started a pilot project to develop bioassessment methods for wetlands in the Casco Bay watershed. They are using the macroinvertebrate and algal communities to evaluate the health of the wetlands. They are testing sampling methods and intend to use multimetric indexes of biological integrity and advanced statistical tests to evaluate the data.

■ Florida is developing an integrated biological approach for evaluating wetlands. The project is focusing on forested and herbaceous depressional wetlands. They are developing sampling methods and multimetric indexes of biological integrity for plants, benthic macroinvertebrates, and fish.

Summary

Currently, most states are not equipped to report on the integrity of their wetlands. Only 11 states and tribes reported attainment of designated uses for wetlands in 1998. National trends cannot be drawn from this limited information. This is expected to change, however, as states adopt wetland water quality standards and enhance their existing monitoring programs to more accurately assess designated use support in their wetlands.

River of Words 1999 Finalist, Jennifer Koo, *Earth's Cry*, Age 18, CA

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Wetlands and the Clean Water Action Plan

The Clean Water Action Plan, announced by President Clinton and Vice President Gore on February 19, 1998, is a comprehensive plan that will not only protect public health through clean water programs but will also restore the health of the nation's waters. The Plan sets strong water protection goals and provides states, communities, farmers, and landowners the tools and resources to meet them. Also included in the Action Plan are cooperative strategies that encourage local communities to develop and implement actions that take a watershed approach (*http://www.cleanwater.gov/*). Within the Action Plan are action items that address wetlands both directly and indirectly. These unique waterbodies are directly addressed through the themes discussed below and are indirectly protected by improving water quality programs, implementing unified watershed assessments, reducing polluted runoff, and improving monitoring and assessment.

A Net Increase of 100,000 Acres of Wetlands per Year by 2005

The Clean Water Action Plan sets an ambitious goal of a net increase of 100,000 acres of wetlands each year, beginning in 2005. To achieve this goal, the Plan includes the following action items:

- The Corps of Engineers (Corps) and EPA will work with their partners to avoid wetland losses, deter unpermitted losses, increase mitigation of unavoidable losses, and improve the reliability of wetland restoration.
- The U.S. Department of Agriculture (USDA) will play a large role in restoring wetlands through the Wetlands Reserve Program, a voluntary program that farmers join to receive financial assistance for protecting wetlands.
- By 2005, EPA will work with the Wetlands and River Corridor Partnership, a group of 30 government and nongovernment organizations involved in habitat restoration, to restore wetlands in 500 watersheds.
- The National Oceanic and Atmospheric Administration (NOAA) will increase the acreage of coastal wetlands restored annually by encouraging wetland restoration planning in state coastal zone management programs. NOAA will also continue state and local partnerships under the Coastal Wetlands, Planning, Protection, and Restoration Program.

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- The Federal Highway Administration (FHA) will increase net wetland acreage resulting from federal aid highway projects by 50% in 10 years.

Consistent Determination of Wetland Losses and Gains

A necessary prerequisite to achieving the wetland goal is ensuring that reliable data systems are in place to record losses and gains in the nation's wetland inventory. Currently the federal government supports two major statistical inventories of wetlands:

- U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI)
- USDA's Natural Resources Inventory (NRI).

These two approaches need to estimate more consistently the rate of wetland loss. The differences between the two approaches need to be reconciled, and a method of tracking wetland gains achieved through restoration needs to be developed to accurately track progress toward the 100,000-acre-per-year goal, evaluate the impact of policy and program decisions on the goal, and make the inventory more sensitive to relatively small changes in acreage. The Plan

U.S. EPA, Office of Water, Wetlands Division

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contains three action items to improve national estimates of changes in wetland acreage:

- The White House Wetlands Working Group will finalize a plan to use existing inventory and data collection systems to develop a single status and trends report for the nation's wetlands by the year 2000.

- The involved federal agencies (EPA, the Corps, NRCS, FWS, and NOAA) will develop technical guidance on restoration, creation, and enhancement of wetland functions.

- The White House Wetlands Working Group will establish an interagency tracking system that will accurately account for wetland loss, restoration, creation, and enhancement.

Geographic-Based Planning to Protect and Restore Wetlands

Although many individual wetland losses are small in terms of area, together the cumulative losses of wetlands and other aquatic habitats accumulate to significant levels of environmental damage in many areas of the United States. One way to better protect these valuable resources is to integrate wetlands and similar habitats into geographic-based planning programs, such as watershed approaches. Geographic-based planning offers the potential to develop a cohesive framework that addresses both clean water and aquatic habitat, reflecting the interdependence between wetlands and other components of a watershed. While geographic-based planning relies on strong local leadership and is enhanced by state or tribal backing, EPA and other federal agencies will contribute by strengthening existing assistance programs and developing new ways to provide support. The Plan contains three action items to improve geographic-based planning to protect and restore wetlands:

- The FWS, NOAA, NRCS, and EPA will coordinate with states and tribes to improve access to information on programs for wetlands and other habitats. Such information will be made available to geographic-based planners through toll-free help lines, the Internet, one-stop information centers, dedicated staff for outreach, and/or newsletters and other publications.

- Watershed Assistance Grants will be established to ensure that those whose wetland interests may be affected by planning have the means to participate in the process.

- The Corps, NOAA, FWS, NRCS, National Park Service, and EPA will provide technical and/or financial assistance to states and tribes to integrate habitat considerations into geographic-based planning and will offer incentives to programs that appropriately balance clean water and habitat factors.

I Want to Be

I want to be a dogfish
and catch a leaping catfish
with whiskers as long as a stream.
And I want to be
the rain trinkling down on the world
telling it it's springtime.

River of Words 1998 Grand Prize Winner (Poetry, Grades K-2)
Noah Frank, Grade 2, CA

River of Words 1998 Grand Prize Winner (Art, Grades 3-6)
Holly Heuer, *Untitled*, Grade 5, CA

John H. McShane, Yellowstone National Park

Ground Water Quality

Ground water is a vital national resource that is used for myriad purposes. It is used for

- Public and domestic water supply systems

- Irrigation and livestock watering

- Industrial, commercial, mining, and thermoelectric power production purposes.

In many parts of the nation, ground water serves as the only reliable source of drinking and irrigation water. Unfortunately, this vital resource is vulnerable to contamination, and ground water contaminant problems are being reported throughout the country.

This 1998 report represents the second 305(b) cycle of data collection based on ground water guidelines introduced to states as part of the 1996 305(b) reporting cycle.

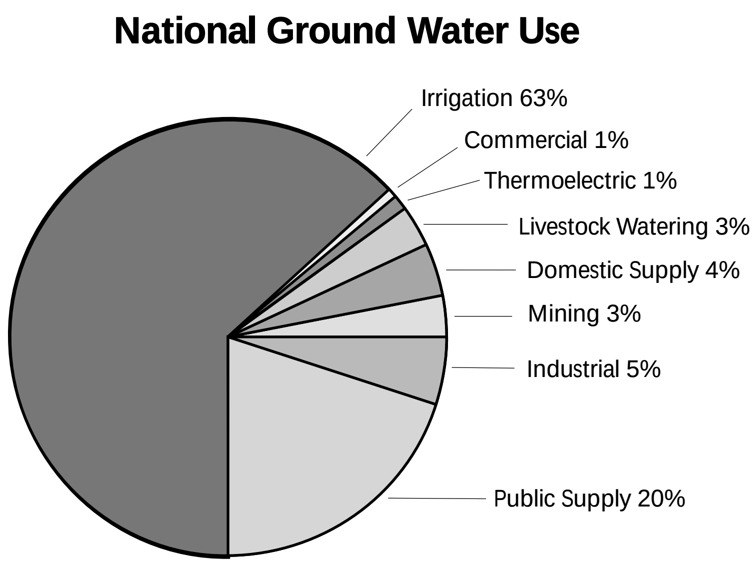
This chapter presents the results of data submitted by 37 states, 3 territories, 4 tribes, and the District of Columbia in their 1998 305(b) water quality reports. States (a term used to include territories, tribes, and the District of Columbia) reported ground water monitoring data for a total of 146 aquifers or hydrogeologic settings. Based on these results, ground water quality in the nation is good and can support the many different uses of this resource. Despite these very positive results, aquifers across the nation are showing measurable impacts stemming from human activities. Through monitoring, elevated levels of petroleum hydrocarbon compounds, volatile organic compounds, nitrate, pesticides, and metals have been detected in ground water across the nation. The detection of some contaminants in ground water (e.g., metals and MTBE) is relatively new and is increasing. With each successive 305(b) report, emerging trends in ground water contaminants will become evident.

Ground Water Use in the United States

Ground water is an important component of our nation's fresh water resources. The use of ground water is of fundamental importance to human life and is also significant to economic vitality. Inventories of ground water and surface water use patterns in the United States emphasize the importance of ground water. The United States Geological Survey (USGS) compiles national water use information every 5 years and publishes a report that summarizes this information. The latest USGS report was issued in October 1998 for the 1995 water year.

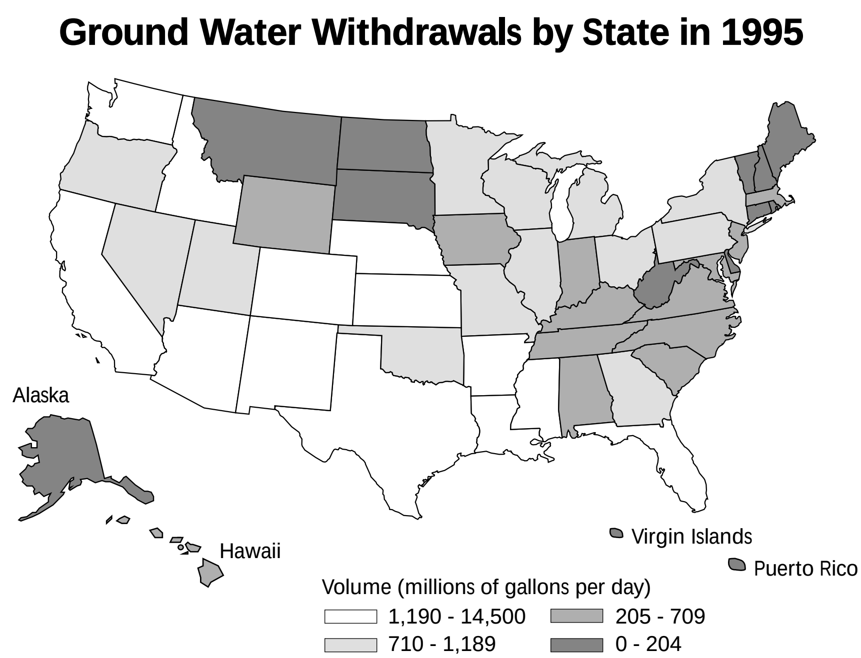
The USGS report shows that ground water provides water for drinking and bathing, irrigation of crop lands, livestock watering, mining, industrial and commercial uses, and thermoelectric cooling

Figure 7-1



Source: *Estimated Use of Water in the United States in 1995.* U.S. Geological Survey Circular 1200, 1998.

Figure 7-2



Source: *Estimated Use of Water in the United States in 1995.* U.S. Geological Survey Circular 1200, 1998.

applications. Figure 7-1 illustrates how ground water use is proportioned among these categories. As shown, irrigation (63%) and public water supply (20%) are the largest uses of ground water.

About 77,500 million gallons of ground water are withdrawn daily. In 1995, the USGS reported that ground water supplied 46% of the nation's overall population and 99% of the population in rural areas with drinking water. Our nation's dependence on this valuable resource is clear.

Every state uses some amount of ground water. Nineteen states obtain more than 25% of their overall water supply from ground water. Ten states obtain more than 50% of their total water supply from ground water.

Each state uses its ground water differently. Ground water use in individual states is a result of numerous interrelated factors generally associated with geography and climate, the principal types of business activities occurring in the state, and population distribution. Fresh ground water withdrawals during 1995 were highest generally in the western states, primarily to supply an increasing population and to sustain important agricultural activities. Figure 7-2 shows the volume of ground water withdrawn by states. The 13 states that have the greatest withdrawals account for 69% of all ground water that is withdrawn nationally.

Overall, agricultural activities account for the majority of ground water used in the nation. Figure 7-3 shows the volume of ground water used for irrigation. Irrigation is important for maintaining yields from crop land in the western and southeastern states. Generally, 75% or more of harvested crop land in many of the western states is irrigated, which represents an important ground water use. Watering of livestock also accounts for significant withdrawals of fresh ground water. Of all the states, California uses the greatest volume of ground water supplies to support agriculture.

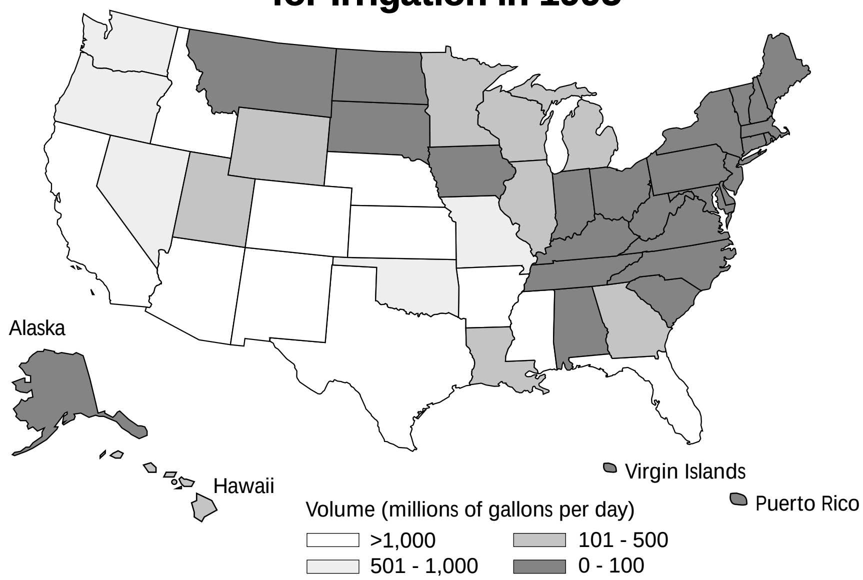
Ground water use trends between 1950 and 1995 generally reflected the observed trends for total water use for the nation (Figure 7-4). From 1950 through 1980, there was a steady increase in fresh ground water withdrawals, which coincided with the steady increase in our nation's total water use. Use of fresh water generally declined after 1980 through 1995, and fresh ground water withdrawals declined in 1995 to nearly 10% less than estimated in 1980. This decline occurred as the nation's population increased 16% over this 15-year period.

The current decline in water use, including ground water use, is attributed primarily to growing recognition in recent years that water is not an unlimited resource. Conservation programs championed by state and local communities lowered public supply per capita use over the same 15-year period.

Two factors are contributing to a lessening demand for water. First, an increase in dry farming practices has decreased the acres of irrigated lands in the west and, thus, has decreased the demand for fresh ground water in this region. Second, improved and more efficient irrigation systems and techniques have contributed to water conservation.

Figure 7-3

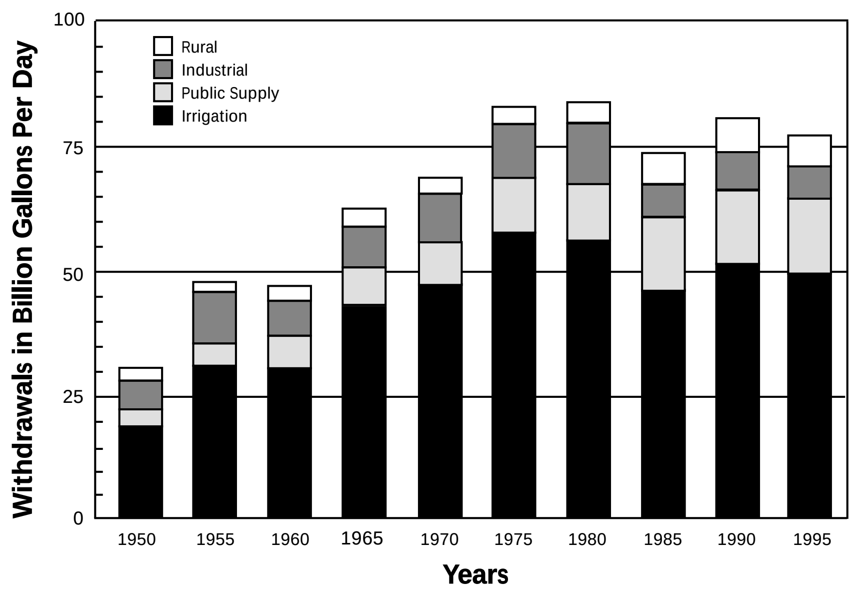
Volume of Ground Water Used for Irrigation in 1995



Source: *Estimated Use of Water in the United States in 1995.* U.S. Geological Survey Circular 1200, 1998.

Figure 7-4

Ground Water Withdrawals in the United States, 1950-1995



Source: http://wwwga.usgs.gov/edu/earthgwusetrend.html

Industry has also improved the efficiency of its manufacturing operations by focusing on water conservation. For example, water recycling practices by industries, adopted to reduce discharges as well as operating costs, have been one important development in the conservation of water in industry.

Ground water continues to be an important component of our nation's water supply. The demand for ground water to meet the nation's needs must be coupled with supply-management practices to conserve this valued resource.

Ground Water Quality

The evaluation of our nation's ground water quality is complex. In evaluating ground water quality under Section 305(b) of the Clean Water Act, our goal is to determine if the resource meets the requirements for its many different uses. Ground water quality can be adversely affected or degraded as a result of human activities that introduce contaminants into the environment. It can also be affected by natural processes that result in elevated concentrations of certain constituents in the ground water. For example, elevated metal concentrations can result when metals are leached into the ground water from minerals present in the earth. High levels of arsenic and uranium are frequently found in ground water in some western states.

Not too long ago, it was thought that soil provided a protective "filter" or "barrier" that immobilized the downward migration of contaminants released on the land surface. Soil was supposed to prevent ground water resources from being contaminated. The detection of pesticides and other contaminants in ground water demonstrated that these resources were indeed vulnerable to contamination. The potential for a contaminant to affect ground water quality is dependent upon its ability to migrate through the overlying soils to the underlying ground water resource.

Ground water contamination can occur as relatively well-defined, localized plumes emanating from specific sources such as leaking underground storage tanks, spills, landfills, waste lagoons, and/or industrial facilities (Figure 7-5). Contamination can also occur as a general deterioration of ground water quality over a wide area due to diffuse nonpoint sources such as agricultural fertilizer and pesticide applications. Ground water quality degradation from diffuse nonpoint sources affects large areas, making it difficult to specify the exact source of the contamination.

Ground water contamination is most common in highly developed areas, agricultural areas, and industrial complexes. Frequently, ground water contamination is discovered long after it has occurred. One reason for this is the slow movement of ground water through aquifers, sometimes as little as fractions of a foot per day. This often results in a delay in the detection of ground water contamination. In some cases, contaminants introduced into the subsurface decades ago are only now being discovered. This also means that the environmental management practices of today will have effects on ground water quality well into the future.

Sources of Ground Water Contamination

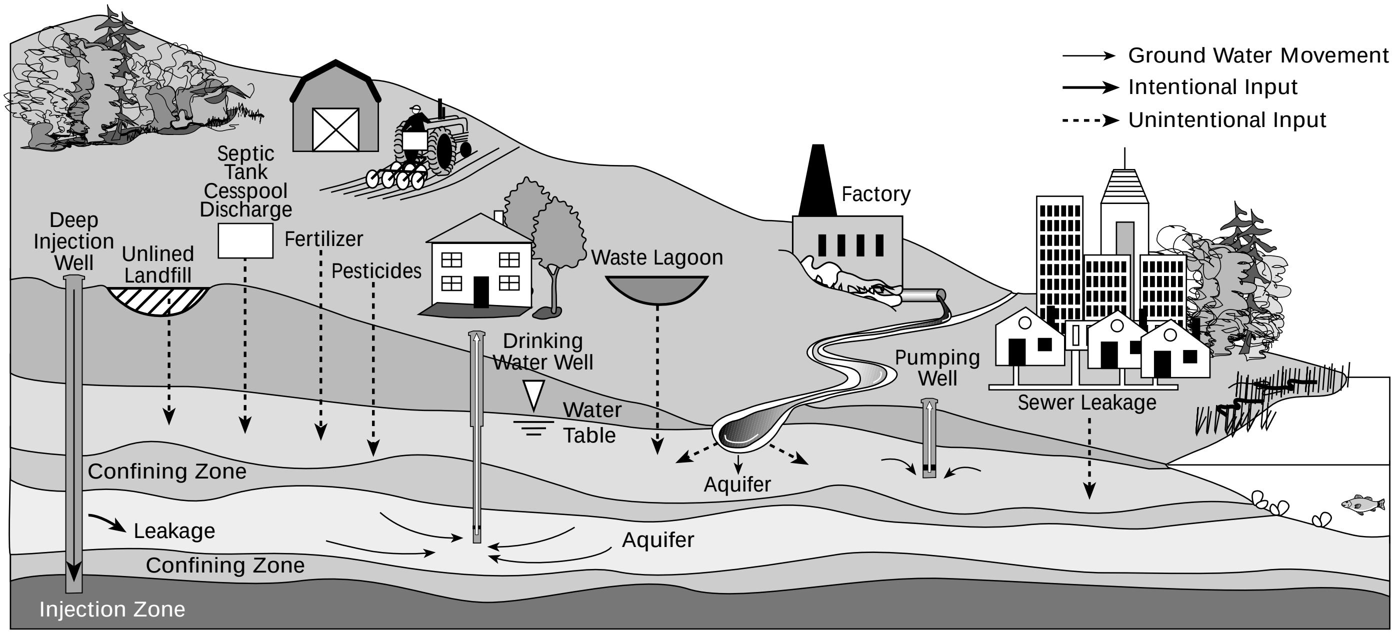
Ground water quality may be adversely impacted by a variety of potential contaminant sources. It can be difficult to identify which sources have the greatest impact on ground water quality because each source varies in the amount of ground water it contaminates. In addition, each source impacts water quality differently.

An EPA/state workgroup developed a list of potential contaminant sources and requested each state to indicate the 10 top sources that potentially threaten their ground water resources. States added sources as was necessary based on state-specific concerns. When selecting sources, states considered numerous factors, including

- The number of each type of contaminant source in the state
- The location relative to ground water sources used for drinking water purposes
- The size of the population at risk from contaminated drinking water
- The risk posed to human health and/or the environment from releases
- Hydrogeologic sensitivity (the ease with which contaminants enter and travel through soil and reach aquifers)
- The findings of the state's ground water assessments and/or related studies.

Figure 7-5

Sources of Ground Water Contamination



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Ground Water and Surface Water – A Single Resource

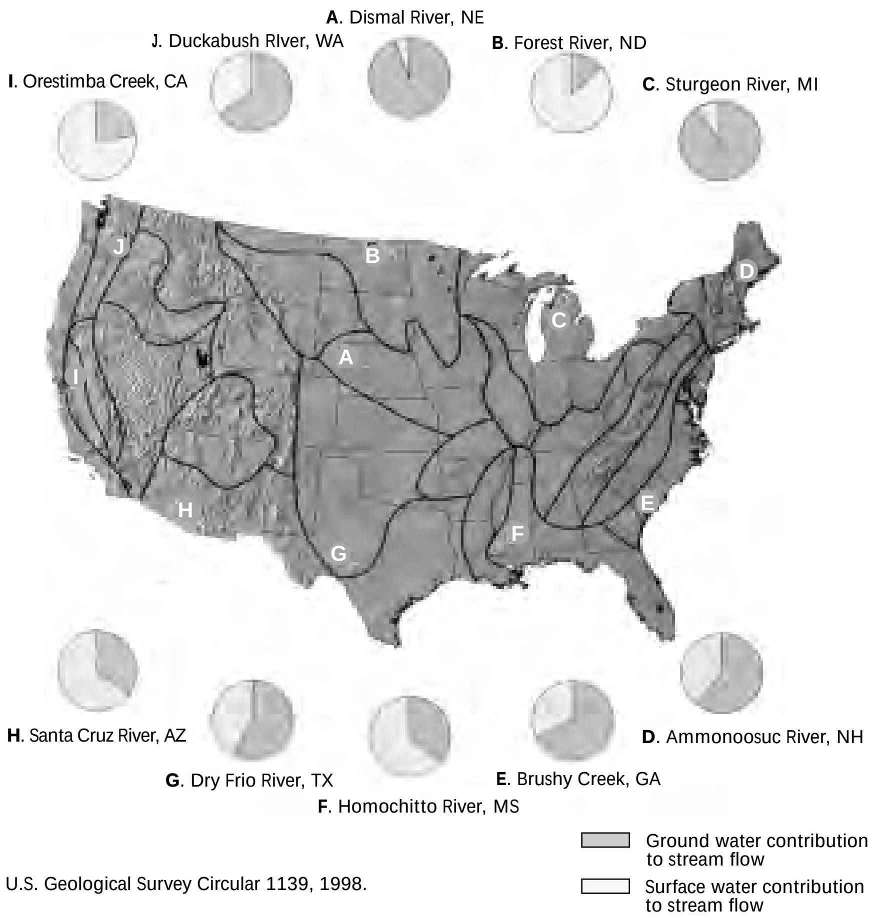
Traditionally, surface water and ground water have been treated as separate entities in the management of water resources. More recently, however, it has become apparent that all waterbody interaction is interrelated. Water in lakes, wetlands, and streams recharges ground water reservoirs, and ground water discharges back into lakes, wetlands, and streams, providing baseflow maintenance. A recent report by the USGS, *Ground Water and Surface Water – A Single Resource*, summarizes these interactions (USGS Circular 1139, 1998).

Ground water contributes to most streams, thereby maintaining streamflow during periods of low flow or drought. The ground water component of streamflow is variable across the country. In one USGS study, 24 regions were delineated on the basis of physiography and climate. Ground water and surface water interactions (i.e., ground water contribution to streamflow) were considered to be similar in each of these regions. Fifty-four streams, with at least two streams in each region, were selected to study ground water and surface water interactions. Daily stream flow values for the 30-year period, 1961 to 1990, were used for the analysis of each stream. The analysis indicated that an average of 52% of all the streamflow in the nation was contributed by ground water. Ground water contributions ranged from 14% to 90%. The ground water contribution to streamflow for selected streams is compared in Figure 1.

Development of surface water resources can affect ground water resources and vice versa. Large withdrawals of ground water can reduce the amount of ground water inflow to surface water and significantly reduce the supplies of surface water available to downstream users. Increased demands on our water resources prior to the 1980 water year (USGS Circular 1200, 1998) caused many surface water supplies to be depleted, particularly in some western states. The use of large volumes or amounts of ground water for irrigation was often identified as the cause of drying river beds and wetlands. Today, conservation and changes in agricultural practices are restoring flow to these rivers and also to ecologically important wetlands areas.

The water quality of each of these resources can also be affected by their interactions. Water quality can be adversely affected when nutrients and contaminants are transported between ground water and surface water. For example, contaminants in streams can affect ground water quality during periods of recharge and flooding. Polluted ground water can affect surface waterbodies when contaminated ground water discharges into a river or stream. Because contamination is not restricted to either waterbody, both ground water and surface water must be considered in water quality assessments.

Coordination between surface water and ground water programs will be essential to adequately evaluate the quality and quantity of our nation's drinking water. Ground water and surface water interactions have a major role in affecting chemical and biological processes in lakes, wetlands, and streams, which in turn affect water quality throughout the system. An understanding of these interactions is critical in our water protection and conservation efforts. It is evident that protection of ground water, as much as protection of surface water, is of major importance for sustaining uses such as drinking water supply, fish and wildlife habitats, swimming, boating, and fishing.



U.S. Geological Survey Circular 1139, 1998.

Figure 1. This map compares ground water contribution to streamflow for selected streams.

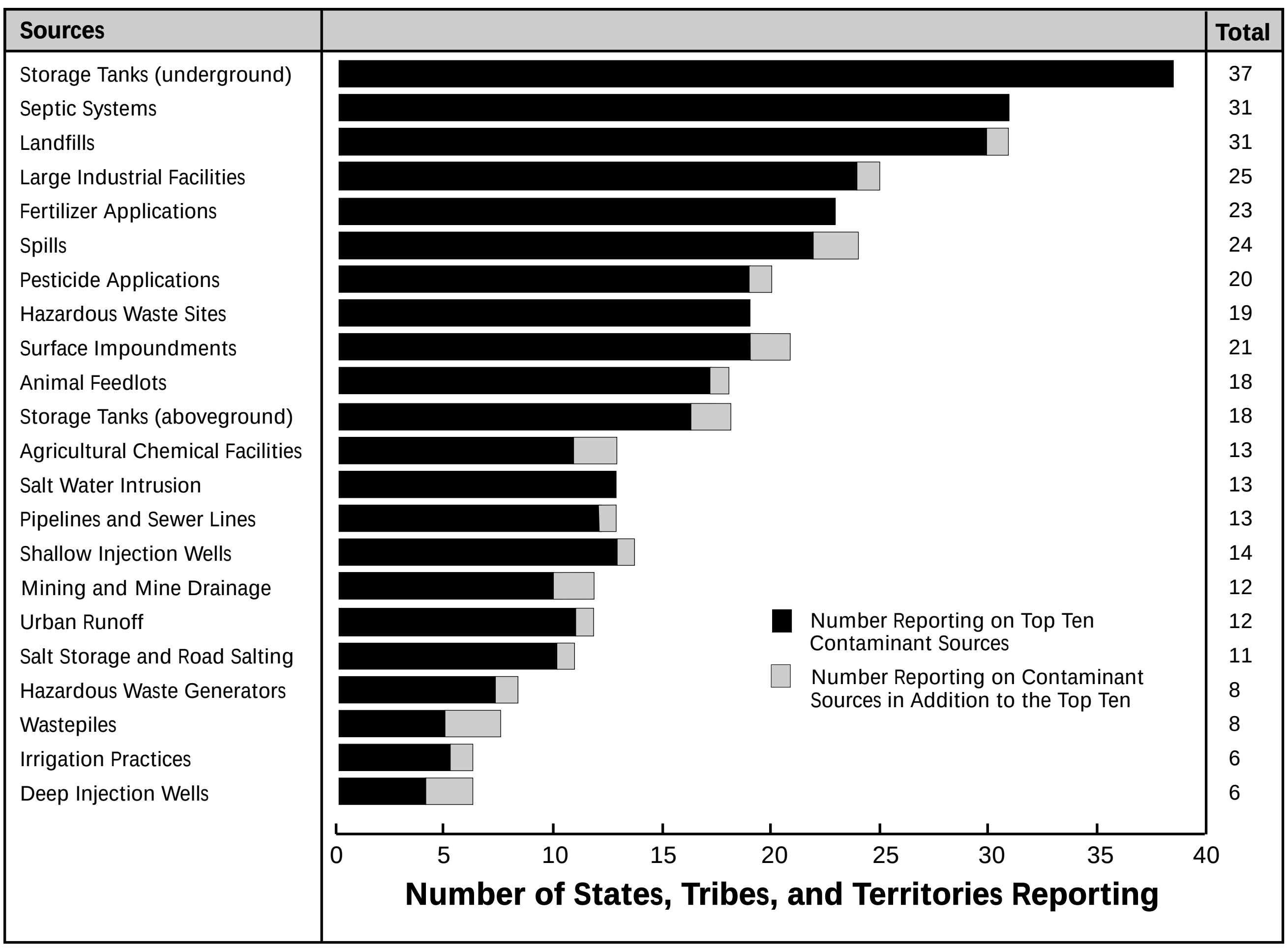
For each of the 10 top sources, states identified the specific contaminants that may impact ground water quality. Figure 7-6 illustrates the sources most frequently cited by states as a potential threat to ground water quality. Leaking underground storage tanks (LUSTs) are the greatest potential source of ground water contamination. Septic systems, landfills, industrial facilities, and fertilizer applications are the next most frequently cited sources of concern. These findings are consistent with state reports during previous 305(b) cycles.

If similar sources are combined, four broad categories emerge as the most important potential sources of ground water contamination:

- Fuel storage practices
- Waste disposal practices
- Agricultural practices
- Industrial practices.

Figure 7-6

Major Sources of Ground Water Contamination



Fuel Storage Practices

Fuel storage practices include the storage of petroleum products in underground and aboveground storage tanks. Although tanks exist in all populated areas, they are generally most concentrated in the more heavily developed urban and suburban areas of a state.

Storage tanks are primarily used to hold petroleum products such as gasoline, diesel fuel, and fuel oil. Leakages can be a significant source of ground water contamination (Figure 7-7). The primary causes of tank leakages are faulty installation or corrosion of tanks and pipelines.

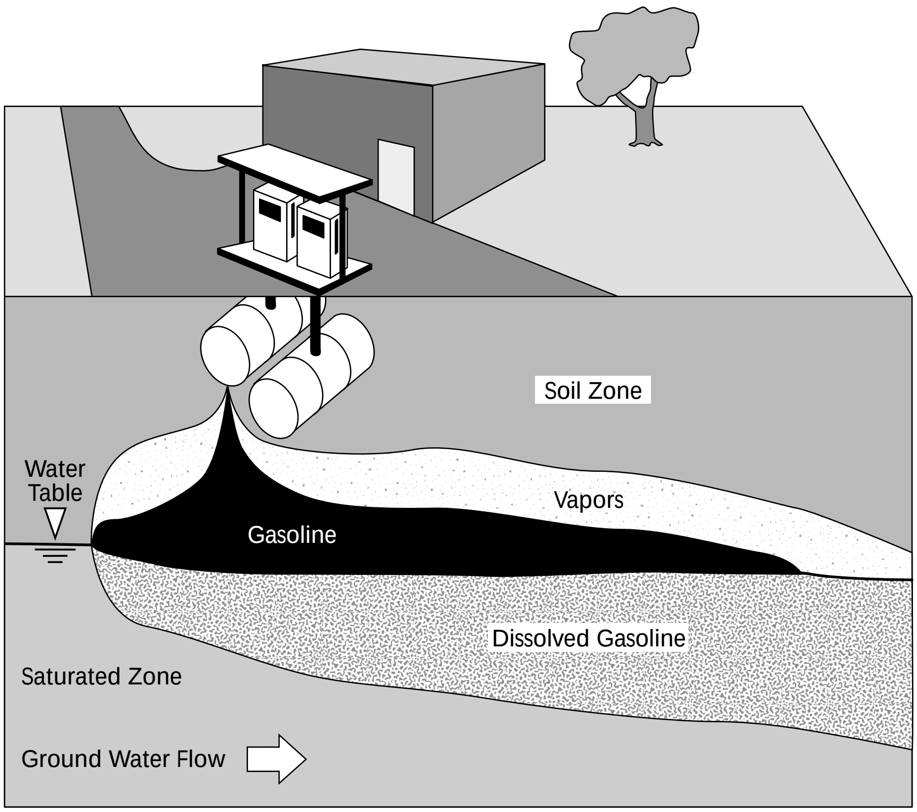
Petroleum products are actually complex mixtures of hundreds of different compounds. Over 200 gasoline compounds can be separated in the mixture. Compounds characterized by a higher water solubility are frequently detected in ground water resources. Four compounds, in particular, are associated with petroleum contamination: benzene, toluene, ethylbenzene, and xylenes. Petroleum-related chemicals threaten the use of ground water for human consumption because some (e.g., benzene) are known to cause cancer even at very low concentrations.

Compounds are added to some fuel products to improve performance. For example, methyl tert-butyl ether (MTBE) is added to boost octane and reduce carbon monoxide and ozone levels. Unfortunately, this compound is highly water soluble and incidents of MTBE contamination in ground water are widely reported across the nation. States report that MTBE is frequently being added to the list of compounds monitored at petroleum release sites. Thus, a new threat to ground water quality has been identified just in the past 5 years.

States report that the organic chemicals associated with petroleum products are common ground water contaminants. Petroleum-related chemicals adversely affect ground water quality in aquifers across the nation. The most significant impacts occur in the uppermost aquifer, which is frequently shallow and often used for domestic purposes.

Figure 7-7

Ground Water Contamination as a Result of Leaking Underground Storage Tanks



Efforts to Fight Air Pollution Create a Water Quality Concern

What began as an effort to fight air pollution became a water quality concern that necessitated dozens of costly studies and created a public health risk. Although methyl tert-butyl ether (MTBE) helps lower tailpipe emissions, it also contaminates ground water supplies. MTBE is more soluble in water and less likely to be degraded than other common petroleum constituents. It is also tentatively classified as a possible human carcinogen by EPA. In studies conducted by the USGS, MTBE was the second most commonly detected volatile organic compound (VOC) in water collected from urban wells and the seventh most commonly detected VOC in urban stormwater. Although frequently detected, only 3% of the urban wells sampled were characterized by concentrations of MTBE that exceeded EPA's draft drinking water health advisory level of 20 micrograms/liter. All of the concentrations measured in urban stormwater were less than the health advisory level.

Waste Disposal Practices

Waste disposal practices include

- Septic systems
- Landfills
- Surface impoundments
- Deep and shallow injection wells
- Wastepiles
- Waste tailings
- Land application
- Unpermitted disposal.

Any practice that involves the handling and disposal of waste has the potential to impact the environment if protective measures are not taken. Contaminants most likely to impact ground water include metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), nitrates, radionuclides, and pathogens. States report that current laws and regulations go a long way toward preventing releases and that many instances of present-day ground water contamination are the result of historic practices.

Improperly constructed and poorly maintained septic systems are believed to cause substantial and widespread nutrient and microbial contamination to ground water. In Montana, approximately 126,000 individual onsite septic systems are used by 252,000 people, and ground water monitoring has shown elevated nitrate levels near areas of concentrated septic systems. Widespread nitrate contamination by individual septic systems and municipal sewage lagoons is a significant ground water contamination problem reported by Colorado and Arizona.

Landfills have long been used to dispose of wastes and, in the past, little regard was given to the potential for ground water contamination in site selection. Landfills were generally sited on land considered to have no other uses. Unlined abandoned sand and gravel pits, old strip mines, marshlands, and sinkholes were often used. In many instances, the water table was at, or very near the ground surface, and the potential for ground water contamination was high. Not surprisingly, states consistently cite landfills as a high-priority source of ground water contamination. Generally, the greatest concern is associated with practices or activities that occurred prior to establishment of construction standards for landfills. Present-day landfills are now required to adhere to stringent construction and ground water monitoring standards.

Generally, discharges to surface impoundments such as pits, ponds, and lagoons are underregulated. In Indiana, many surface impoundments neither discharge to surface water nor have designed outfalls; as a consequence, they have the potential to leach metals, volatile organic compounds, and semivolatile organic compounds to ground water. In Colorado, wells located downgradient from tailings ponds or cyanide heaps associated with mining operations often exhibit high concentrations of metals. Arizona also identified surface impoundments and leach fields as significant sources of volatile organic compounds.

Class V injection wells include shallow wastewater disposal wells, septic systems, storm water drains, and agricultural drainage systems. Class V injection wells are used to dispose of wastewaters directly into the ground. Because they are not designed to treat the wastewaters released through them, ground water supplies can become contaminated. The large number and diversity of Class V injection wells pose a significant potential threat to ground water. The state of Indiana indicated that they are targeting these installations for further legislative controls.

Agricultural Practices

Agricultural practices that have the potential to contaminate ground water include

- Animal feedlots
- Fertilizer and pesticide applications
- Irrigation practices
- Agricultural chemical facilities
- Drainage wells.

Ground water contamination can be a result of routine applications, spillage, or misuse of pesticides and fertilizers during handling and storage, manure storage/ spreading, improper storage of chemicals, and irrigation return drains serving as a direct conduit to ground water. Fields with over-applied and/or misapplied fertilizers and pesticides can introduce nitrogen, pesticides, cadmium, chloride, mercury, and selenium into the ground water. States report that agricultural practices continue to be a major source of ground water contamination.

Animal feeding operations can pose a number of risks to water quality and public health, mainly because of the amount of animal manure and wastewater they generate. Animal feedlots often have impoundments from which wastes may infiltrate to ground water. Livestock waste is a source of nitrate, bacteria, total dissolved solids, and sulfates.

Livestock is an integral component of many states' economies. As a consequence, concentrated animal feeding operations occur in many states. The high concentration of manure in feedlot areas causes confined animal feedlots to be a concern for contributing to ground water contamination.

Shallow unconfined aquifers in many states have become contaminated from the application of fertilizer. Crop fertilization is the most important agricultural practice contributing nitrate to the environment. Nitrate is considered by many to be the most widespread ground water contaminant. To help combat the problems associated with the overuse of fertilizers, the U.S. Department of Agriculture's Natural Resources Conservation Service assists crop producers in developing nutrient management plans.

Human-induced salinity also occurs in agricultural regions where irrigation is used extensively. Irrigation water continually flushes nitrate-related compounds from fertilizers into the shallow aquifers along with high levels of chloride, sodium, and other metals, thereby increasing the salinity of the underlying aquifers.

Risk of Multiple Contaminants

In a recent study by the University of Wisconsin-Madison, researchers noted that common mixtures of pesticides and fertilizers can have biological effects at the current concentrations measured in ground water. Specifically, the combination of aldicarb, atrazine, and nitrate, which are the most common contaminants detected in ground water, can influence the immune and endocrine systems as well as affect neurological health. Changes in the ability to learn and in patterns of aggression were observed. Effects are most noticeable when a single pesticide is combined with nitrate fertilizer. Research shows that children and developing fetuses are most at risk. EPA is developing an approach to deal with mixtures under the cumulative risk policy. The initial step is to deal with mixtures on a case-by-case basis beginning with the organophosphate pesticides as a group. Dealing with mixtures of chemicals under the Food Quality Protection Act and Safe Drinking Water Act will continue to be a challenge in the future.*

*Porter et al. 1999. *Toxicology and Industrial Health* 15, 133-150.

Metals in the Environment

Metals may be present in industrial and commercial process waste streams. These metals tend to be persistent with little to no potential for degradation. Predicting their mobility and toxicity is complex due to the large number of chemical reactions that can affect their behavior. The scientific community is only just now beginning to unravel the intricacies involved in predicting metals behavior in the environment.

Pesticide use and application practices are of great concern. The primary routes of pesticide transport to ground water are through leaching or by spills and direct infiltration through drainage controls. Pesticide infiltration is generally greatest when rainfall is intense and occurs shortly after the pesticide is applied. Within sensitive areas, ground water monitoring has shown fairly widespread detections of pesticides, specifically the pesticide atrazine. Many states are developing or have developed specific management plans to better control pesticide application rates and frequency to lessen the impacts on the resource.

Industrial Practices

Raw materials and waste handling in industrial processes can pose a threat to ground water quality. States noted that industrial facilities, hazardous waste generators, and manufacturing/repair shops all present the potential for releases. Storage of raw materials at the facility are a problem if the materials are stored improperly and leaks or spills occur. Examples include chemical drums that are carelessly stacked or damaged and/or dry materials that are exposed to rainfall. Material transport and transfer operations at these facilities can also be a cause for concern. If a tanker operator is careless when delivering raw materials to a facility, spills may occur.

The most common contaminants are metals, volatile organic compounds, semivolatile organic compounds, and petroleum compounds. States reported releases of each of these contaminant types in association with industrial practices in their 1998 305(b) reports as both a current and potential threat to ground water quality.

Cyanide spills associated with ore processing continue to affect ground water quality in Montana. Ground water contamination extending beyond mine properties has occurred at nine ore processing facilities. Water supplies have been affected by at least three spills. Thirty-eight ore processors are known to have used cyanide at some point during their operation, and, of these facilities, four remain active. Cyanide will continue to affect the quality of Montana's ground water in these mining areas from past releases as well as from the potential threat of future accidental releases.

Spills are a source of grave concern among states. The state of Indiana reported that about 50 spills occur per week. In 1996, 41 million gallons of chemicals, industrial wastes, and agricultural products were spilled in Indiana. Montana reports an average of 300 accidental spills each year. On average, approximately 15 of these spills require extensive cleanup and followup ground water monitoring. One of these was the 1995 derailment of railroad tanker cars in the Helena rail yard that threatened to contaminate ground water with 17,400 gallons of fuel oil. Followup monitoring demonstrated that rapid response actions had prevented the majority of the contaminants from reaching local aquifers.

Volatile organic compounds associated with solvent spills and leaks from electronics, aerospace, and military facilities that use these chemicals as degreasing agents were identified by Arizona as major sources of ground water contamination. South Carolina determined that accidental spills and leaks are the second most common source of ground water contamination, and, as in Arizona, these releases can usually be associated with petroleum-based products attributed to machinery maintenance or manufacturing. Spills will never become entirely preventable, but industry, local governments, and states are cooperating to control spills when they do occur so that the impact to the environment is minimized

Development of new technologies and new products to replace organic solvents is continuing. For example, organic biodegradable solvents derived from plants are being developed for large-scale industrial applications. Environmentally responsible dry cleaning technologies are being developed that eliminate the need for perchloroethylene. Legislation is being considered in New York and by other local governments and states that would ban the use of perchloroethylene by the dry cleaning industry.

State Overview of Contaminant Sources

States inventory the types and numbers of contaminant sources having the potential to impact ground water quality in selected aquifers. This type of information serves three purposes:

- To identify contaminant sources with the greatest potential to impact ground water quality based on sheer number of sites

- To determine the number of sites actually having impacted ground water resources

- To determine the remedial actions being taken to address the contamination and the degree of success.

For 1998, 26 states reported contaminant source information for specific aquifers. Table 7-1 summarizes contaminant source information for those 26 states. Many states do not yet track this type of information in an easily accessible format.

As shown in Table 7-1, underground storage tanks (USTs) represent the highest number of potential sources of ground water contamination. These findings are consistent with data reported during the 1996 305(b) cycle. Over 85,000 UST sites were reported in 72 hydrogeologic settings in 22 states. Of these tanks, 57% were characterized by confirmed contaminant releases to the environment and 18% had releases that adversely affected ground water quality. These sites are slowly being cleaned up and restored. Nearly 21,500 (25%) of these sites have been remediated as of late 1998. Much of the money that supports cleanup operations is provided by State Underground Tank Remediation Funds. Eighteen states reported that they have fully established Remediation Funds.

States ranked underground injection sites as second on the list of potential sources of contamination. More than 31,000 underground injection sites exist in the 72 settings evaluated. The percent with confirmed ground water contamination is less than 5%, suggesting that underground injection sites are less of a threat than leaking USTs.

State sites include unregulated chemical spills or historic sites for which there is no responsible party. These sites are not covered by an EPA regulatory program. State sites accounted for over 12,000 sites present in 34 hydrogeologic settings. Of these sites, over 50% have confirmed contaminant releases and over 25% have confirmed ground water impacts.

For each of the sources listed in Table 7-1, states attempted to identify the types of contaminants most likely to be present. Although contaminants ranged from asbestos to radionuclides, the most frequently cited contaminants were

- Volatile organic compounds
- Petroleum compounds
- Metals
- Pesticides
- Nitrate.

Volatile organic compounds and petroleum compounds were each cited as contaminants of concern in 60% of the hydrogeologic settings for which states reported data. Metals were measured in ground water collected from 52% of the hydrogeologic settings. Pesticides and nitrate were cited 31% and 22% of the time, respectively.

Table 7-1. Summary of Contaminant Source Type and Number

Source Type	Number of States Reporting Information	Number of Aquifers or Hydrogeologic Settings for Which Information Was Reported	Total Sites	Number of Sites with Confirmed Releases		Number of Sites with Confirmed Ground Water Contamination	
				Number	Percent of Total	Number	Percent of Total
LUST	22	72	85,067	48,320	57	15,436	18
Underground Injection	17	72	31,480	1,313	4	172	<1
State Sites	17	34	12,202	6,199	51	3,139	26
DOD/DOE	17	54	8,705	4,470	51	286	3
CERCLA (non-NPL)	19	59	3,506	1,381	39	802	23
RCRA Corrective Action	19	50	2,696	538	20	267	10
Nonpoint Sources	8	29	2,030	44	2	31	<2
Landfills	6	26	1,356	110	8	110	8
NPL	22	66	307	275	90	249	81

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
DOD/DOE = Department of Defense/Department of Energy.
LUST = Leaking Underground Storage Tank.
NPL = National Priority List.
RCRA = Resource Conservation and Recovery Act.
— = Not available.

Ground Water Assessments

The 1998 305(b) reporting cycle was the second cycle for which states reported quantitative ground water monitoring data on an aquifer-specific basis. Data reporting increased in uniformity in 1998 as states became familiar with the revised Ground Water Guidelines and began developing methodologies to report the data in the format requested. Increased consistency in the way data were submitted allowed for more meaningful comparisons of reported data.

Thirty-one states reported ground water monitoring data that were used in this assessment. Ten states and tribes reported ground water monitoring data for the first time in 1998. Additional data from 14 states were also received, but the data were not compatible with the 305(b) data format and could not be used in the national summary. Figure 7-8 shows the states that submitted ground water data for the 1998 305(b) reporting cycle.

States that achieved full state coverage in 1996 reported their most recent monitoring results for 1998. States that implemented rotating monitoring plans reported data for additional aquifers within the state.

Texas is an example of a state that uses a rotating monitoring design. The Texas Groundwater Protection Committee is the

Hydrogeologic Settings

This term describes the geologic-related ground water and surface water factors that affect and control ground water movement into an area. Factors—such as depth to ground water, soil type, and the amount of recharge—can be used to map areas with common characteristics. It is possible then to make generalizations about the vulnerability of the setting to potential contaminants.

Aller et al. 1987. *DRASTIC — A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings.* EPA/600/2-87/035. U.S. Environmental Protection Agency.

Number of Sites with Active Remediation		Number of Sites with Cleanup Completed	
Number	Percent of Total	Number	Percent of Total
3,044	4	21,438	25
61	<1	452	<2
753	6	3,242	27
1,717	20	1,937	22
229	7	316	9
95	4	67	3
5	<1	3	<1
2	<1	—	—
83	27	33	11

coordinating entity for Texas ground water issues. The Texas Water Development Board performs ambient ground water monitoring on a selected number of Texas aquifers each year so that all major and minor aquifers of the state are monitored within a 5-year period.

Major and minor aquifers underlie approximately 76% of Texas' 267,338 square miles of land surface. Major aquifers produce large quantities of water in a larger area of the state. Minor aquifers produce significant quantities of water within smaller geographic areas or small quantities in large geographic areas. Nine major aquifers and twenty minor aquifers have been delineated within the state.

Approximately 4,200 domestic and agricultural water wells are sampled as part of this 5-year program.

Figure 7-8

States Reporting Ground Water Data

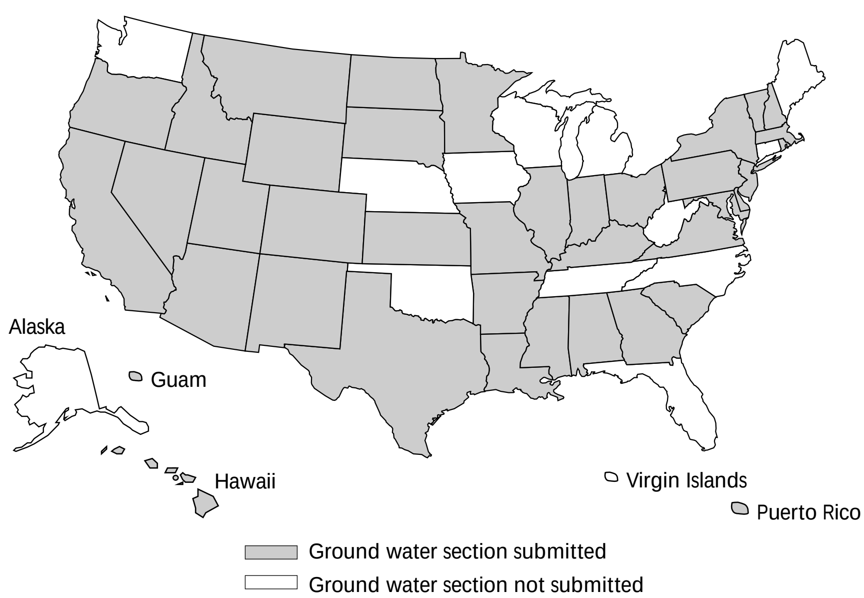


Figure 7-9 illustrates the aquifers assessed during the first three monitoring cycles. The remaining Texas aquifers will be assessed for 2000 and 2001.

Texas' goal is to completely assess all major and minor aquifers every 5 years. After this first 5-year cycle is complete, a historical analysis of ambient ground water quality will begin as the state repeats the cycle.

Hawaii provides yet another plan for implementing statewide ground water assessment. Hawaii designed a three-phased plan. Phase I uses existing information from the Department of Health aquifer research program and wellhead protection assessments. These data are compared with ground water contamination maps of detected organic chemical contamination in the state. Together these data provide an overlay of the location of aquifers in the state, locations where contaminants have been detected, and specific aquifer/wellhead areas that have been assessed for vulnerability to contamination. Phase I assessments were submitted as part of the 1998 305(b) cycle.

Phase II assessments will be reported as part of the 2000 and 2002 305(b) cycles. They will be based on data from the Hawaii Source Water Assessment Program (HISWAP). Phase II information will provide comprehensive data on public drinking water sources and will identify

■ Source water protection areas

■ Sources of contamination

■ Susceptibility of source water to contamination.

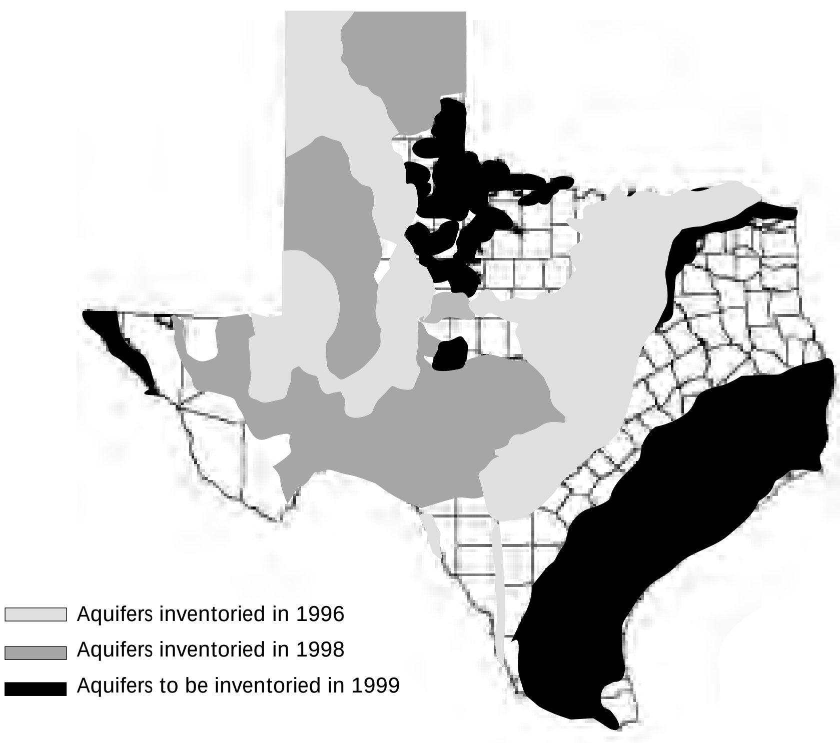
Phase III assessment will include all completed HISWAP assessments and any ambient ground water data collected and/or analyzed. Phase III will produce a comprehensive database of public drinking water sources and ambient ground water data. Implementation of this phase will depend on pending policy and budget decisions.

Ground Water Quality Data

For the 1998 305(b) cycle, states assessed ground water quality using three primary sources of data: ambient ground water monitoring data, unfinished water quality data, and finished water quality data (Figure 7-10). Furthermore, states reported results for a smaller suite of analytes relative to the 1996 305(b) cycle, focusing primarily on volatile organic compounds, semivolatile organic compounds, and nitrate. Emphasis on these three parameter groupings is warranted because the presence of

Figure 7-9

Texas Water Quality Inventory



Framework for Compiling State Data

Assessment of ground water quality under the 305(b) program is evolving, and many changes have been implemented over the past decade to develop an accurate representation of our nation's ground water quality. One of the most significant changes was the request that states begin reporting ground water monitoring data for specific aquifers or hydrogeologic settings within the state. As the states began reporting monitoring data for multiple hydrogeologic settings, EPA responded by developing a database to compile and maintain the large volume of ambient ground water quality data being reported as part of the 305(b) program. This database provides a framework for state-reported ground water quality data.

Currently, the dataset contains ground water monitoring data for 243 hydrogeologic settings, representing data reported by states for the 1996 and 1998 305(b) cycles. Obviously, this set of data provides limited national coverage, and only a limited assessment of ground water quality on a national basis is possible at this time. However, a framework for reporting and compiling data on a biennial basis has been established, and, as states report new data with each successive 305(b) cycle, the data set will mature. With continuing efforts, an accurate and representative assessment of our nation's ground water resources should emerge.

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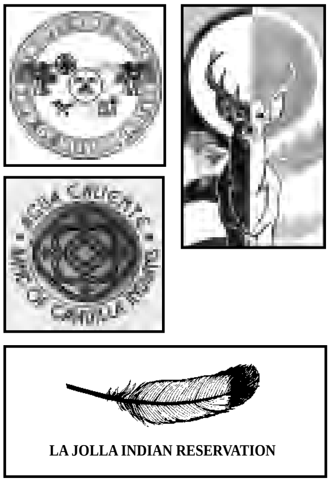
Tribal 305(b) Submittals



Four Native American tribes submitted ground water information in their 305(b) water quality reports in 1998. They are

- La Jolla Band of Indians of Pauma Valley, California
- Twenty-Nine Palms Band of Mission Indians of Coachella, California
- Torres-Martinez Desert Cahuilla Indians of Thermal, California
- Agua Caliente Band of Cahuilla Indians of Palm Springs, California.

La Jolla Band of Indians is located in the San Luis Rey River Ground Water Basin and the other three tribes are located in the Coachella Valley Groundwater Basin. The Coachella Valley Water District has undertaken extensive studies to estimate ground water production and overdraft in the Valley. Recent estimates indicate that ground water is in an overdraft situation with more water being pumped out of the Valley than is entering as recharge. Estimates of overdraft in the lower Valley range from 50,000 to 150,000 acre-feet per year. Approximately half of the overdraft is attributed to agriculture and half is attributed to municipal and recreational uses.

Anthropogenic sources of ground water contamination include agricultural chemical facilities, fertilizer applications, irrigation and drainage practices, wastepiles, deep and shallow injection wells, septic systems, underground storage tanks, and industrial facilities. The overdraft situation in the Valley causes higher hydraulic gradients and increases the potential for ground water contaminants to affect ground water resources. One very common contaminant that is detected in ground water on the reservations is nitrate. All four tribes assessed ground water quality using nitrate as an indicator parameter.

Natural sources of contamination also impact ground water quality. Fluoride-bearing minerals present in the aquifer substrate contribute high levels of fluoride to ground water. Arsenic and radionuclides may also be present in ground water through leaching of natural

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sources. All four tribes assessed ground water quality for fluoride. Three of the four tribes assessed arsenic and either gross alpha or uranium concentrations as well. Arsenic and radionuclide data were not available to the La Jolla Band of Indians.

Ground water assessments were conducted by reviewing historic water quality data of operating wells, monitoring the quality of water from springs, and collecting supplemental ground water quality data in the vicinity of the reservations. The number of wells sampled ranged from five wells (La Jolla Band of Indians) to 47 wells (Agua Caliente Band of Cahuilla Indians). Common parameters monitored on the reservations included nitrate, arsenic, fluoride, radionuclides, volatile organic compounds, and semivolatile organic compounds. Monitoring data were compared to federal drinking water standards to assess whether the ground water met beneficial uses such as drinking water, agricultural supply, and/or industrial supply.

Nitrate is present at detectable concentrations in ground water collected from all four reservations. However, the maximum contaminant level, or MCL, for nitrate is rarely exceeded. Fluoride and arsenic are also present at detectable concentrations. Radionuclides are measured at concentrations that are generally representative of background conditions.

Fluoride was the most frequently detected constituent at concentrations exceeding the drinking water standard in ground water collected from the 29 Palms Reservation. Fluoride was measured at concentrations exceeding one-half the drinking water standard in ground water collected from the Torres-Martinez Reservation. In contrast, nearly 30%, or 20 out of 71 samples, exceeded the MCL for arsenic in ground water collected from the Torres-Martinez Reservation. MCL exceedances were rarely observed in ground water collected from the Agua Caliente Reservation. Of the three tribes that tested for volatile organic compounds or semivolatile organic compounds, no concentrations exceeded the MCL. Hence, although some water quality issues may exist on the reservations, these water quality impacts do not seem to be caused by anthropogenic sources. Rather, most of the observed MCL exceedances can be traced back to natural sources.

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Different Types of Monitoring Settings

Thirty-one states reported data summarizing ground water quality. In total, data were reported for 146 aquifers or other hydrogeologic settings for the 1998 305(b) cycle. States that were unable to report ground water quality data for specific aquifers assessed ground water quality using a number of different hydrogeologic settings, including statewide summaries, counties, watersheds, basins, and sites or areas chosen for specific monitoring purposes. A brief description of several ground water assessment methods and their rationale is presented.

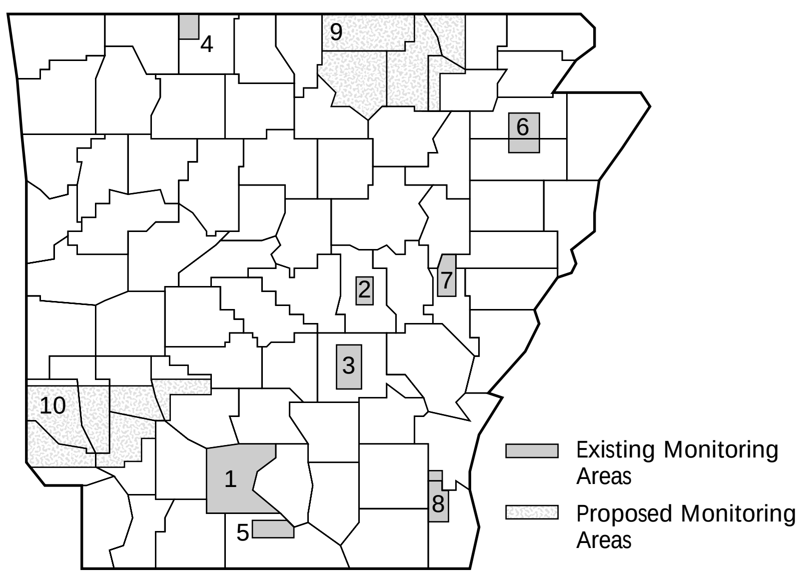

Figure 1. Arkansas Ambient Ground Water Monitoring Program

Existing monitoring areas include Ouachita (1), Lonoke (2), Pine Bluff (3), Omaha (4), El Dorado (5), Jonesboro (6), Brinkley (7), and Chicot (8). Expansion areas will include Hardy (9) and Athens Plateau (10).

Arkansas – Ambient Ground Water Monitoring Program

The Arkansas Department of Pollution Control and Ecology began its Ambient Ground Water Monitoring Program in 1986 to monitor overall ground water quality in the state. The Program currently consists of eight active monitoring areas and two proposed areas selected to evaluate potential impacts from multiple land uses (Figure 1). The areas are in different counties covering the diverse geologic, hydrologic, and economic regimes within the state. One area is characterized by the largest community using ground water to meet all of its needs. An objective of the monitoring program is to monitor water quality that is affected by public and commercial well use. For the 1998 305(b) cycle, Arkansas reported their most recent round of results for the eight active monitoring areas.

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Indiana – Hydrogeologic Settings

Indiana developed a system that allows for data to be analyzed according to similar surface and subsurface environments. To interpret the ground water sensitivity to contamination, the analysis considers the composition, thickness, and geometry of the aquifers; variability of the confining units; surface and ground water interactions; and recharge/discharge relationships (Figure 2). For the 1998 305(b) cycle, Indiana selected hydrogeologic settings that were vulnerable to contamination and contain large populated areas (i.e., areas of greatest ground water demand). These settings were principally outwash deposits or fans of glacial origin.

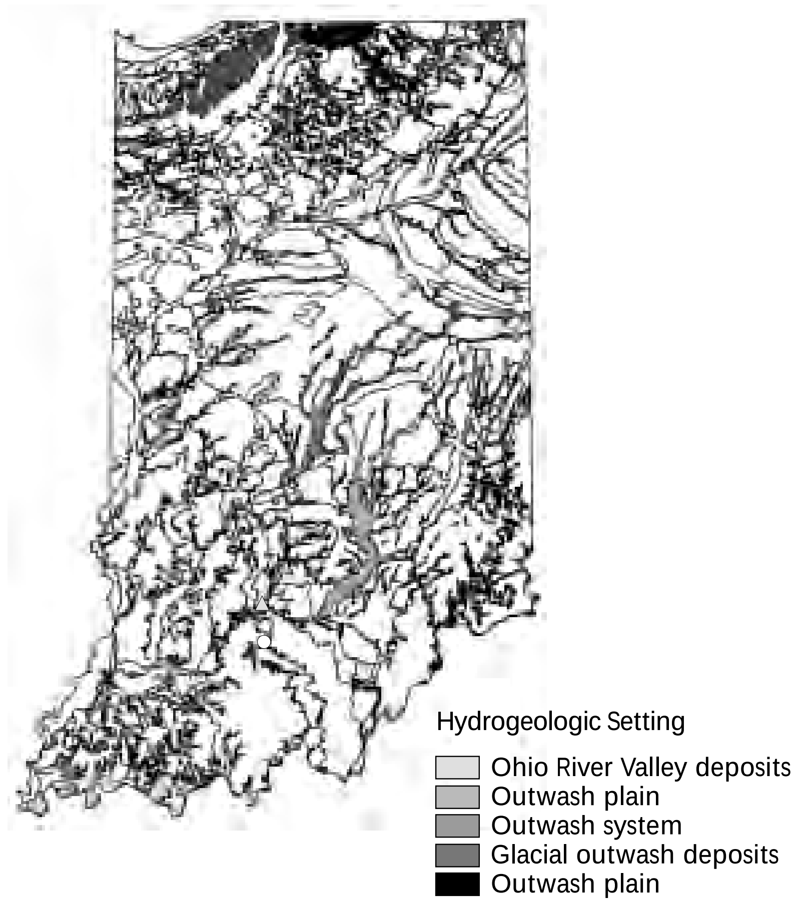

Figure 2. Map of Hydrogeologic Settings

Alabama – Cumberland Plateau Ground Water Province

Alabama divided the state into physiographic provinces and is assessing ground water quality in aquifers in different provinces with each successive 305(b) cycle. Ground water quality in the Tuscumbia Fort Payne Aquifer outcrop area in the Highland Rim Province

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was evaluated in 1996. Alabama provided ground water quality data for the Cumberland Plateau Ground Water Province for 1998 (Figure 3). This area includes all or parts of 13 counties in north Alabama that are underlain by three major aquifer outcrop areas. The aquifers outcropping include the Pottsville Aquifer, the Tuscumbia-Fort Payne Aquifer, and those aquifers of Cambrian-Ordovician age. The shallow aquifers of the Cumberland Plateau Ground Water Province are considered vulnerable to contamination from surface sources through fractures and sinkholes that provide direct recharge to the subsurface. Some of these aquifers are also highly vulnerable to contamination through karst features that provide direct access from the surface into the aquifer.

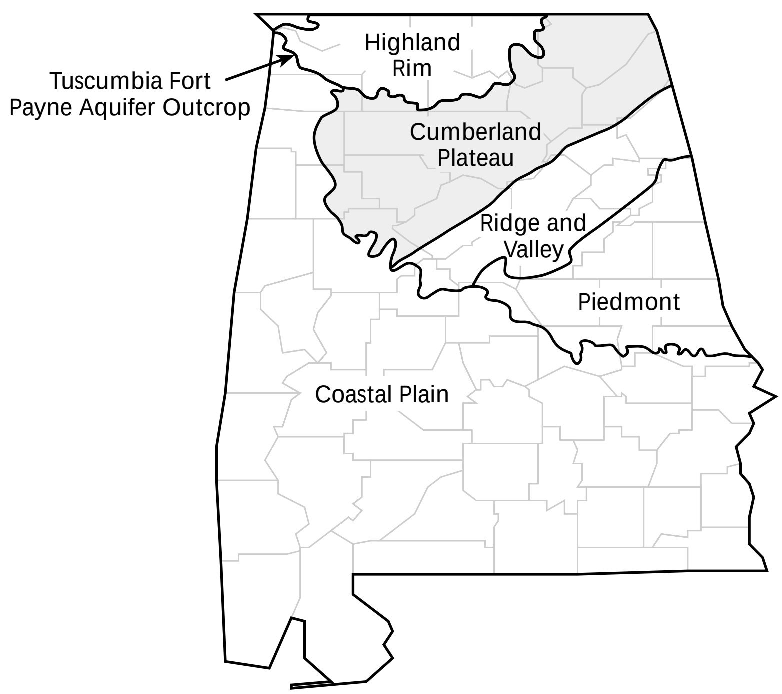


Figure 3. Alabama Physiographic Provinces

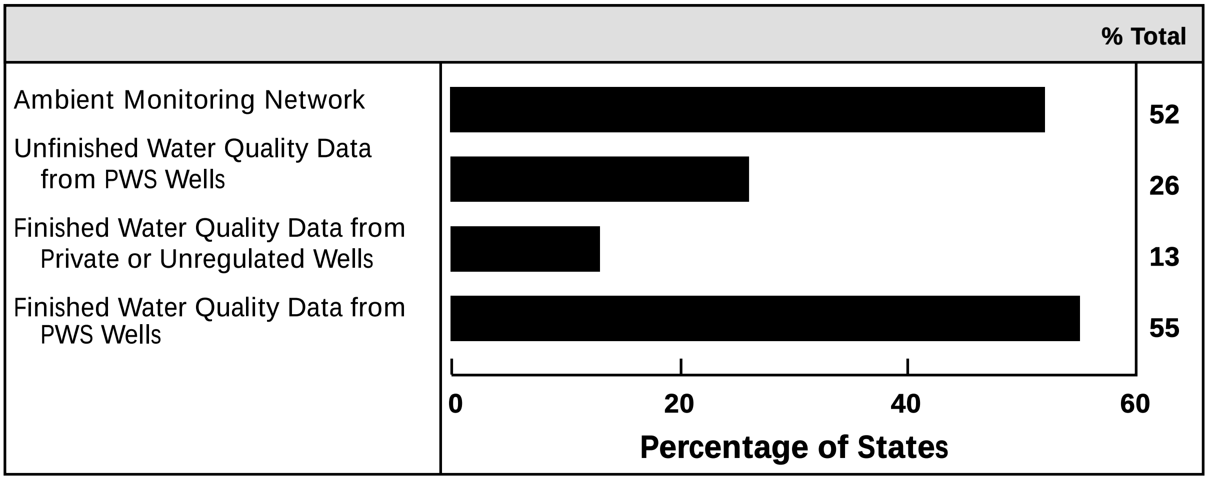
manufactured compounds (i.e., the volatile organic compounds and semivolatile organic compounds) in ground water is a definitive indication of contamination from human sources. Even if only limited data are available for assessing ground water quality, the presence of VOC and SVOCs is of serious concern. The presence of nitrate at concentrations exceeding background levels is another sign of human impacts to ground water quality. In fact, states indicated that they used nitrate as an "indicator" parameter of water quality impacts, and all 31 states reported nitrate data.

States also reported monitoring data for an "others" category. This usually referenced inorganic and/or metallic contaminants. Inorganic constituents generally referred to water quality parameters that were more reflective of natural background conditions than adverse impacts to ground water quality resulting from human activities. Some examples include sodium, calcium, magnesium, potassium, bicarbonate, fluoride, and chloride. In contrast, elevated concentrations of some metals can be a strong indication of water quality impacts resulting from human activities. Metals that reflect human activities include barium, arsenic, mercury, cadmium, zinc, lead, selenium, copper, chromium, silver, and nickel.

Tables 7-2 through 7-6 present state data for nitrate, VOCs, SVOCs, pesticides, and metals. In most cases, the reported data represent average concentration values for the monitoring period. However, some states reported results based on the maximum concentration detected in wells during the monitoring period. It is important to remember that the aquifer monitoring data reported by states represent different sources, often with different monitoring purposes, and care must be taken in making data

Figure 7-10

Sources of Ground Water Monitoring Data



Note: Percentage based on a total of 31 states submitting data. Some states used multiple data sources.

comparisons. Monitoring data most closely approximating actual ground water conditions (e.g., untreated ground water) are given special consideration in these assessments.

States reported aquifer monitoring data for nitrate more frequently than for any other parameter or parameter group. Nitrate is well suited for use as an indicator parameter. Its presence in ground water systems is indicative of human activities and it can be detected at relatively low concentrations through the use of standard, reliable, and relatively inexpensive analytical methodologies.

Table 7-2 presents aquifer monitoring data for nitrate for the 1998 305(b) reporting cycle. With the exception of untreated water quality data from public water supply (PWS) wells, the maximum contaminant level (MCL) of 10 mg/L was exceeded in at least 40% of the hydrogeologic settings for which states reported nitrate data. However, although elevated nitrate levels were documented by states in ground water, the percentage of wells that were impacted by nitrate levels in excess of the MCL was less than 5% for ambient ground water monitoring networks and less than 1% for drinking water sources. The percentage of wells impacted by nitrate was higher in the two special studies reported by states. However, these studies were specifically designed to monitor land use effects with the potential to contribute nitrate to the environment, so their data may be skewed.

Tables 7-3 through 7-5 provide summary information for VOCs, SVOCs, and pesticides. States reported ground water monitoring data for VOCs more frequently than for either SVOCs or pesticides.

Table 7-2. Monitoring Results for Nitrates

Monitoring Type	Number of States Reporting	Number of States Reporting MCL Exceedances	Total Number of Units for Which Data Were Reported	Number of Units Having MCL Exceedances	Total Number of Wells for Which Data Were Reported	Number of Wells Impacted by MCL Exceedances	Highest Number of Wells that Exceeded MCL within a Single Unit	Average Number of Wells that Exceeded MCL within a Single Unit
Ambient Monitoring Network	16	10	95	38 (40%)	7,555	307	55 out of 114	8
Unfinished Water Quality Data from PWS Wells	8	0	20	0	538	0	0 out of 173	0
Unfinished Water Quality Data from Private or Unregulated Wells	4	3	4	3 (75%)	12,180	62	48 out of 3,165	21
Finished Water Quality Data from PWS wells	17	10	57	26 (46%)	32,936	379	284 out of 3,057	14
Special Studies	2	2	6	4 (67%)	424	68	33 out of 96	17

MCL = Maximum contaminant level.
PWS = Public water supply.

Approximately half of the reporting states indicated that VOCs had exceeded MCLs in ground water. Approximately 25% of the hydrogeologic settings were characterized by MCL exceedances of VOCs in ambient ground water. However, only 6% of the wells used to assess ambient ground water quality were characterized by MCL exceedances of VOCs. The greatest percentage of MCL exceedances (9%) was observed in private and unregulated wells.

Four states reported data for pesticides in ambient ground water. Of these four states, two states reported the presence of pesticides at concentrations exceeding MCLs. Levels of pesticides exceeding MCLs impacted 17% of the hydrogeologic settings and 2% of the wells monitoring ambient ground water conditions. Semivolatile organic compounds were rarely measured in ground water at concentrations exceeding MCLs.

Forty percent of the hydrogeologic settings for which states reported ambient ground water monitoring data were affected by metal concentrations that exceeded MCL values. The percentage of hydrogeologic settings affected by elevated metal concentrations was even higher for untreated and finished water collected from PWS wells. Again, although the number of settings is relatively high, the percentage of wells that are characterized by MCL exceedances is relatively low with approximately only 1% of the wells monitoring ambient ground water conditions being impacted. In contrast, 12% of the wells supplying untreated water quality data from PWS were impacted.

Table 7-3. Monitoring Results for Volatile Organic Compounds

Monitoring Type	Number of States Reporting	Number of States Reporting MCL Exceed-ances	Total Number of Units for Which Data Were Reported	Number of Units Having MCL Exceedances	Total Number of Wells for Which Data Were Reported	Number of Wells Impacted by MCL Exceed-ances	Highest Number of Wells that Exceeded MCL within a Single Unit	Average Number of Wells that Exceeded MCL within a Single Unit
Ambient Monitoring Network	9	4	55	13 (24%)	3,644	214 (6%)	143 out of 441	16
Unfinished Water Quality Data from PWS Wells	6	3	18	3 (17%)	404	9	6 out of 11	3
Unfinished Water Quality Data from Private or Unregulated Wells	1	1	2	1 (50%)	23	2 (9%)	2 out of 19	2
Finished Water Quality Data from PWS wells	17	9	60	13 (22%)	17,021	83	47 out of 1,484	6
Special Studies	1	0	1	0	0	0	0	0

MCL = Maximum contaminant level.
PWS = Public water supply.

Examples of State Assessments

Although very positive strides were made in assessing ground water quality in 1998, ground water data collection under Section 305(b) is still too immature to provide national assessments. Despite the lack of national coverage, states have demonstrated strong assessment capabilities. Following are descriptions of two states' assessments that may be useful to other states in designing and implementing monitoring programs.

Idaho

Idaho is one of the top five states in the nation with respect to the volume of ground water used to meet the needs of its population. Idahoans use an average of 9 billion gallons of ground water daily. Sixty percent of this water is used for crop irrigation and stock animals, 36% is used by industry, and 3% to 4% is used for drinking water. Even though the volume of ground water used as drinking water is relatively small in comparison to the total ground water used, more than 90% of the total population in Idaho relies on ground water for drinking water supply.

To characterize and protect this valuable resource, Idaho developed a monitoring approach that includes a statewide ambient ground water quality monitoring network integrated with regional and local monitoring. The statewide monitoring network is used to

- Characterize ground water quality conditions
- Identify trends in ground water quality

Table 7-4. Monitoring Results for Semivolatile Organic Compounds

Monitoring Type	Number of States Reporting	Number of States Reporting MCL Exceed-ances	Total Number of Units for Which Data Were Reported	Number of Units Having MCL Exceedances	Total Number of Wells for Which Data Were Reported	Number of Wells Impacted by MCL Exceed-ances	Highest Number of Wells that Exceeded MCL within a Single Unit	Average Number of Wells that Exceeded MCL within a Single Unit
Ambient Monitoring Network	6	1	18	1	357	1	1 out of 81	1
Unfinished Water Quality Data from PWS Wells	7	1	16	1	338	1	1 out of 26	1
Unfinished Water Quality Data from Private or Unregulated Wells	1	0	1	0	2	0	0 out of 2	0
Finished Water Quality Data from PWS wells	15	2	36	2	12,518	8	7 out of 193	4
Special Studies	—	—	—	—	—	—	—	—

MCL = Maximum contaminant level.
PWS = Public water supply.
— = Not applicable.

■ Identify existing and emerging ground water quality concerns in Idaho's major aquifers.

The monitoring network consists of a statistically designed set of more than 1,500 sites (wells and springs) used for domestic, irrigation, public water supply, and stock purposes. These sites are sampled on a rotational basis so that most locations are sampled at least once every 4-year period, with some wells being sampled yearly. Ground water samples are analyzed for many of the analytes monitored under the Safe Drinking Water Act. All samples are analyzed for volatile organic compounds, nutrients, fecal coliform, trace elements, radionuclides, pesticides, and major ions.

Regional and local monitoring can be used to (1) identify and delineate ground water contamination problems that are smaller in scale and may not be immediately evident on the larger scale of the statewide monitoring effort, (2) determine the areal extent of ground water contamination to ensure that beneficial uses are protected, (3) determine the effectiveness of remediation activities and best management practices, and (4) provide information, direction, and prioritization to state ground water quality programs. Thus far, regional or local monitoring projects have been used to further characterize many of the aquifers in Idaho, especially those where ground water quality has been identified as a concern.

Idaho has a very diverse geology and there are numerous aquifers and aquifer types throughout the state. Seventy major flow systems, with each flow system comprising one or more major aquifers, have been identified and combined into 22 hydrogeologic areas. Each area represents

Table 7-5. Monitoring Results for Pesticides

Monitoring Type	Number of States Reporting	Number of States Reporting MCL Exceedances	Total Number of Units for Which Data Were Reported	Number of Units Having MCL Exceedances	Total Number of Wells for Which Data Were Reported	Number of Wells Impacted by MCL Exceedances	Highest Number of Wells that Exceeded MCL within a Single Unit	Average Number of Wells that Exceeded MCL within a Single Unit
Ambient Monitoring Network	4	2	18	3 (17%)	758	16 (2%)	8 out of 25	5
Unfinished Water Quality Data from PWS Wells	1	1	7	1	46	2	2 out of 3	2
Unfinished Water Quality Data from Private or Unregulated Wells	1	0	1	0	27	0	0 out of 27	0
Finished Water Quality Data from PWS wells	1	1	1	1	8	1	1 out of 8	1
Special Studies	2	1	4	2	328	2	1 out of 96	1

MCL = Maximum contaminant level.
PWS = Public water supply.

geologically similar areas and generally encompasses one or several of the 70 major ground water flow systems. Figure 7-11 shows the hydrogeologic area boundaries and the major flow systems within Idaho.

For ground water quality management purposes, including implementation of regional and local monitoring, areas or flow systems are usually further broken down to a single aquifer or portion of an aquifer that focuses on a specific priority area. These priority area boundaries are usually based on considerations such as land use, hydrogeology, ground water quality, political boundaries, wellhead (source water) protection areas, and watershed boundaries. Figure 7-12 illustrates some of these priority areas where there are elevated levels of nitrate. This information is being used to provide direction to various ground water quality protection programs in Idaho.

Data collected from all monitoring efforts thus far indicate that most of Idaho's ground water is both potable and safe for current beneficial uses. However, no area tested is free of contaminant concerns. At least 7% of the sites had a constituent with a concentration exceeding the Safe Drinking Water Act maximum contaminant level. Initial trend analyses indicate that, overall, nitrate concentrations increased from the first round (1991 through 1995) of sampling to the second round (1995 through 1998). Although results show that only 3% of sample sites across Idaho exceed the nitrate MCL of 10 milligrams per liter, within the nitrate priority areas (Figure 7-12), this value increases to about 17%.

Table 7-6. Monitoring Results for Metals

Monitoring Type	Number of States Reporting	Number of States Reporting MCL Exceed-ances	Total Number of Units for Which Data Were Reported	Number of Units Having MCL Exceedances	Total Number of Wells for Which Data Were Reported	Number of Wells Impacted by MCL Exceed-ances	Highest Number of Wells that Exceeded MCL within a Single Unit	Average Number of Wells that Exceeded MCL within a Single Unit
Ambient Monitoring Network	7	5	40	16 (40%)	19,636	111 (<1%)	24 out of 28	5
Unfinished Water Quality Data from PWS Wells	4	2	4	2	199	23 (12%)	20 out of 71	8
Unfinished Water Quality Data from Private or Unregulated Wells	1	0	1	0	5	0	0 out of 5	0
Finished Water Quality Data from PWS wells	3	2	4	2	3,380	63	46 out of 1,107	16
Special Studies	1	0	2	0	63	0	0	0

MCL = Maximum contaminant level.
PWS = Public water supply.

Pennsylvania

Nearly half of the population in Pennsylvania relies on ground water for drinking water purposes, and, in some areas, ground water serves as the sole source of water. To protect its ground water resources, Pennsylvania developed a ground water monitoring system that accomplishes the following goals:

- Measures ambient ground water quality
- Provides an indication of long-term ground water quality trends resulting from land use practices
- Assesses the success or failure of land management practices.

Pennsylvania's ground water monitoring program was developed following division of the state into 478 ground water basins (Figure 7-13). Although the basins are not true hydrologic units, each basin considers similarities in hydrologic

Figure 7-11

Idaho's Hydrogeologic Subareas and Major Aquifer Flow Systems

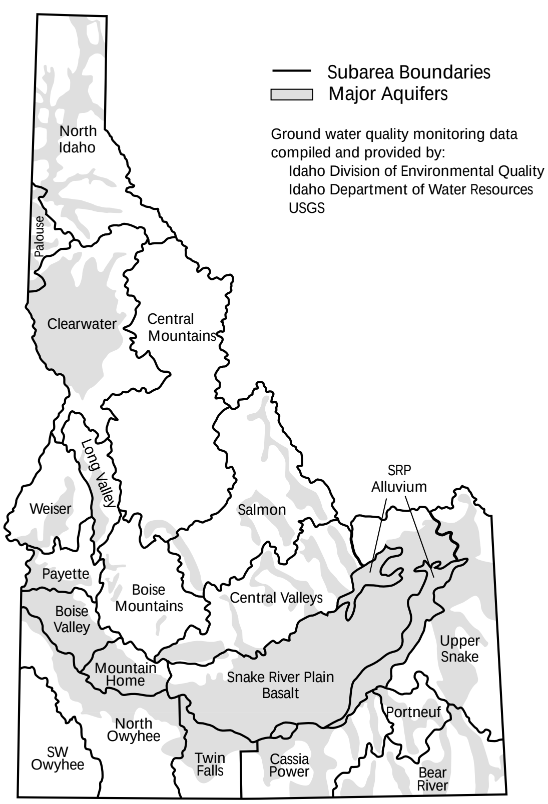
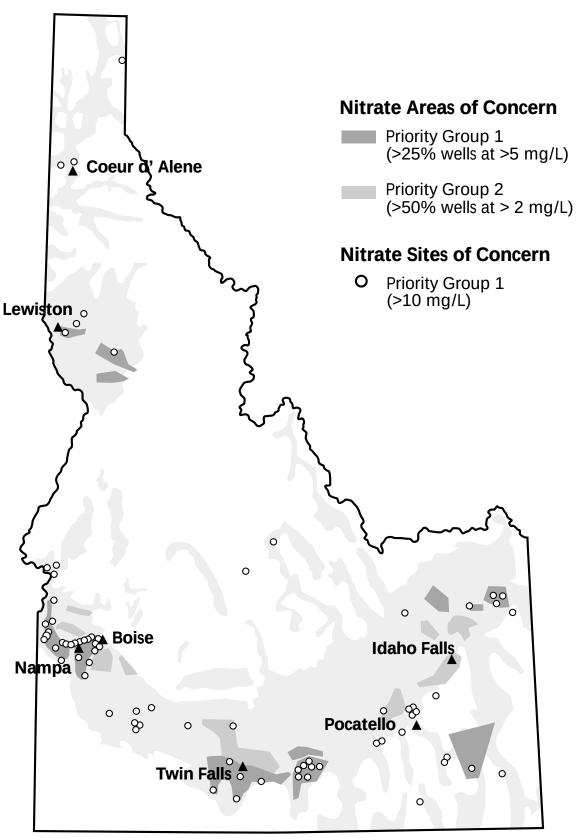


Figure 7-12

Ground Water Areas and Sites Impacted by Nitrate



and physical features. The basins were prioritized for monitoring purposes in 1985 according to three main factors:

- Ground water use
- Potential unmonitored sources of ground water pollution
- Environmental sensitivity.

The 50 highest-ranking basins were selected for monitoring.

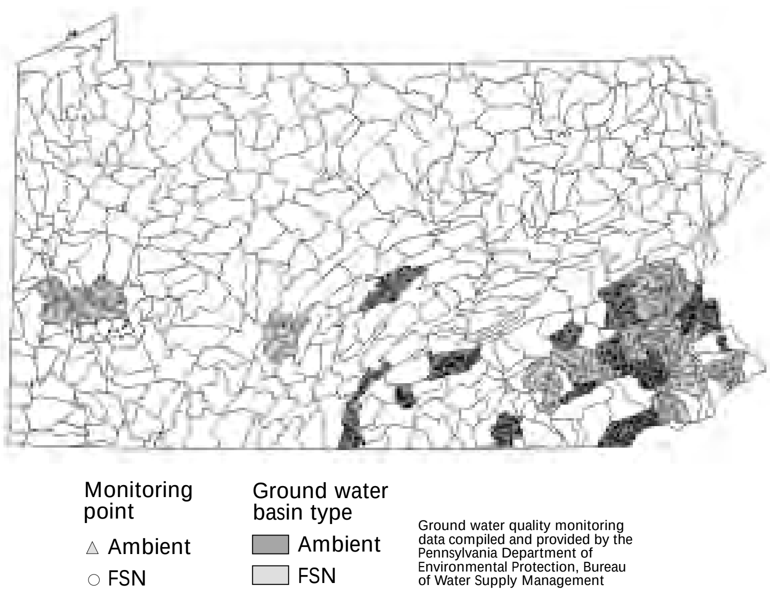
Two types of ground water monitoring are used (Figure 7-13). Ambient monitoring is used to collect basin-wide data for basins where little ground water quality data exist. Typically, two rounds of samples are collected in one hydrologic year. Ambient monitoring supplements other data collection efforts and provides a general picture of ground water quality in the watershed. Fixed station network monitoring is used when long-term data are required. Fixed station monitoring involves collecting two rounds of ground water samples per hydrologic year for a minimum of 5 years. Basins selected for this type of monitoring are typically high-priority basins where regional changes are occurring such as rapid urbanization or other modifications in land use or where specific water quality problems exist.

Results indicate that ground water quality in Pennsylvania is typically good. This is despite sampling in high-priority basins, which likely biases the data and presents a more negative picture of the overall ground water quality.

In spite of the overall good quality of ground water, exceedances of drinking water standards were detected. Some exceedances result from naturally elevated concentrations of substances such as iron, total dissolved solids, manganese, or low pH. However, trend analyses of nitrate, sodium, chloride, and total hardness suggest that ground water quality in Pennsylvania is undergoing some change that likely results from human activities. Sodium and chloride were two of the analytes exhibiting upward trends at more than 10% of the 478 monitoring points (Figure 7-14). Analytes with downward trends at more than 10% of the 478 monitoring points included pH, nitrate, magnesium, and sulfate.

Figure 7-13

Location of High-Priority Ambient and Fixed Station Network (FSN) Ground Water Basins and Monitoring Points



Ground water quality monitoring data compiled and provided by the Pennsylvania Department of Environmental Protection, Bureau of Water Supply Management

Exact causes of the ground water quality trends are difficult to determine. Different areas of the state are obviously under different stresses and only general inferences can be made from the data. Natural shifts in ground water quality may result from changes in precipitation trends or cycles. Downward trends in nitrate and sulfate at many monitoring points may reflect a reduction in sources of nitrate from agricultural areas (fertilizers), septic systems, and atmospheric deposition. Increasing trends in total dissolved solids (TDS), chloride, calcium, potassium, total hardness, and sodium at many monitoring points may result from increased nonpoint source pollution such as road salting and sprawling paved developments and suburbs.

Conclusions and Findings

Based on results reported by states as part of the 1998 305(b) cycle, the following are concluded:

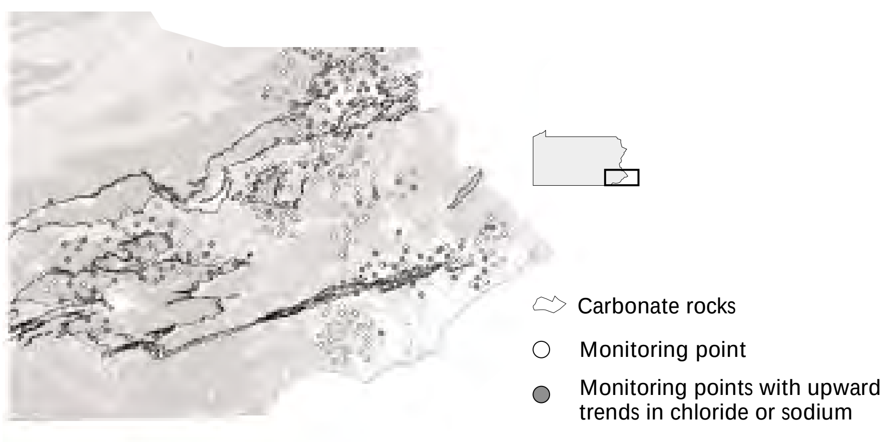
■ Ground water is an important component of our nation's fresh water resources. The use of ground water is of fundamental importance to human life and is also of significant importance to our nation's economic vitality.

■ Assessing the quality of our nation's ground water resources is no easy task. An accurate and representative assessment of ambient ground water quality requires a well-planned and well-executed monitoring plan. Although the 305(b) program is definitely moving in the direction of more and better ground water quality assessments, there is still much more that needs to be done. Coverage, both in terms of the area within a state and the number of states reporting ground water quality monitoring data, needs to be enlarged. States also need to focus on collecting ground water data that are most representative of the resource itself. Specifically, states need to rely less on finished water quality data and more on ambient ground water quality data.

■ Good quality data is essential to forming a basis for determining ground water quality. Required source water assessments under Section 1453 of the Safe Drinking Water Act should prove to be helpful in augmenting the amount

Figure 7-14

Monitoring Points with Upward Trends in Sodium or Chloride



Ground water quality monitoring data compiled and provided by the Pennsylvania Department of Environmental Protection, Bureau of Water Supply Management of data available and to generate good quality data that can be used to evaluate ground water quality over time.

- The 1996 and 1998 305(b) reporting cycles represent the first time that states reported quantitative ground water quality data. One of the greatest successes was the increase in uniformity of data reported by states for 1998. There was an increase in reporting uniformity over the course of just one 305(b) cycle as states became increasingly familiar with the reporting guidelines and developed methods for obtaining and reporting the requested data.

- Although ground water quality assessments are being performed and reported under the 305(b) program, vast differences in ground water management are apparent. Several states have implemented monitoring programs designed to characterize ground water quality and identify and address potential threats to ground water. Other states have only just begun to implement ground water protection strategies.

- One of the most important factors in deciding state priorities concerning the assessment of ground water quality is economic constraints. Characterizing and monitoring ground water quality is expensive. Few states have the economic resources to assess ground water quality across an entire state. Therefore, states are applying different approaches to ground water protection. These approaches are based on each state's individual challenges and economic constraints. Approaches range from implementing statewide ambient ground water monitoring networks to monitoring selected aquifers on a rotating basis. States determine the approach based on the use of the resource, vulnerability to contamination, and state management decisions.

- National coverage increased from 1996 to 1998. In the 1996 305(b) reporting cycle, states reported ground water monitoring data for a total of 162 hydrogeologic settings. In 1998, states reported data for 146 hydrogeologic settings. Data for 65 of the 146 settings described in 1998 represented the most recent monitoring results for units previously described in 1996. Thus, data were reported for 81 new hydrogeologic settings in 1998.

- The conceptual framework for designing and implementing a ground water monitoring network is similar across the nation. The Intergovernmental Task Force on Monitoring Water Quality (ITFM) concluded that the definition and characterization of environmental monitoring settings is a crucial first step in the collection of meaningful ground water quality data. States across the nation are taking this first step and defining and characterizing hydrogeologic monitoring units. Each of the states described in detail their approach and the rationale for that approach.

- EPA and the states need to devise more efficient ways to integrate ground water data collected through the Section 305(b) water quality inventory reports and ground water data collected from state source water assessments under Section 1453 of the SDWA.

Other monitoring data from wellhead protection delineations, source inventories, and other data collection efforts also must be integrated to increase and improve the information that is used to make determinations on the quality of ground water across the nation in the reporting requirement under Section 305(b) of the CWA.

■ Although much progress has been made in the 305(b) program to assess ground water quality, large gaps in coverage exist. The data submitted by states under the 305(b) program preclude a comprehensive representation of ground water quality in the nation at this time but, more importantly, may result in a skewed characterization of ground water quality that is more positive than actual conditions. If this is the case, problems in ground water quality may not be recognized until quality has been degraded to the point that the resource can no longer support the desired uses.

■ Based upon ground water quality data reported by states during the 1996 and 1998 305(b) cycles, ground water quality in the nation is good and continues to support the various uses of this resource.

■ Ground water contamination incidents are being reported in aquifers across the nation. Leaking underground storage tanks have consistently been reported as an important source of ground water contamination for all 305(b) cycles for which data were reported. In general, the threat from leaking underground storage tanks is due to the sheer number of tanks buried above water tables across the nation. Other important sources of ground water contamination include septic systems, landfills, hazardous waste sites, surface impoundments, industrial facilities, and agricultural land practices.

■ Petroleum chemicals, volatile organic compounds, semivolatile organic compounds, pesticides, nitrate, and metals have been measured at elevated levels in ground water across the nation. The most frequently cited contaminants of concern were volatile organic compounds and petroleum chemicals. These classes of chemicals have consistently been reported as ground water contaminants. States have also reported increasing detections of chemicals not previously measured in ground water (for example, MTBE and metals). The recent detection of these chemicals may represent emerging trends in ground water contamination.

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Public Health and Aquatic Life Concerns

Previous chapters described states' and tribes' efforts to assess the status of waters compared to state and tribal water quality standards. States and tribes adopted water quality standards specifically to protect public health and aquatic life. These standards include designated uses such as swimming, fish consumption, drinking water, and aquatic life. Water quality standards also include numeric criteria, which establish thresholds for the levels of individual pollutants that are safe for human exposure and aquatic life.

This chapter describes how impaired water quality may affect public health and aquatic life. It is made up of several sections, each describing efforts to protect different beneficial uses. These uses include fish and wildlife consumption, shellfish consumption, drinking water, recreation, and aquatic life.

Water pollution threatens both public health and aquatic life. Public health may be threatened directly through the consumption of contaminated food and/or drinking water or indirectly through skin exposure to contaminants present in recreational and/or bathing waters. Contaminants that threaten human health include toxic chemicals as well as viruses and bacteria.

Many contaminants present in our environment have the potential to affect human health. Toxic chemicals have been linked to human birth defects, cancer, neurological disorders, and kidney ailments. Waterborne viruses and bacteria can cause infectious hepatitis, gastroenteritis, dysentery, and cholera.

Although aquatic organisms can tolerate most viruses and bacteria harmful to humans, they may be more severely affected by the presence of toxic chemicals in their environment than humans. Toxic chemicals have the potential to kill all aquatic organisms within a community, kill select organisms within the community, increase susceptibility to disease, interfere with reproduction, or reduce the viability of their young. Toxic chemicals may also affect aquatic organisms indirectly by altering the delicate physical and chemical balance that supports life in an aquatic community. Whole aquatic communities can be lost either directly or indirectly as a result of chemical contamination in the water. Aquatic organisms are also particularly susceptible to changes in the physical quality of their environments, such as changes in pH, temperature, dissolved oxygen, and habitat.

Many toxic chemicals concentrate in fish and shellfish.

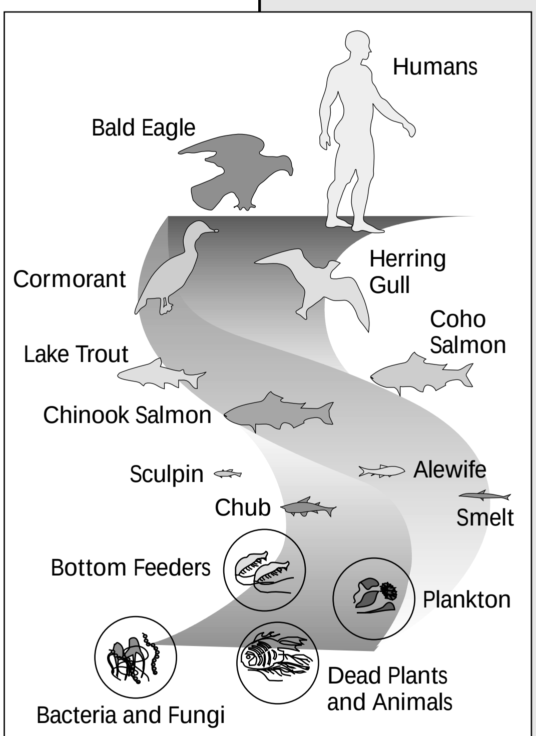
Public Health Concerns

Toxic chemicals that remain in the environment for long periods of time can affect public health through a variety of different exposure pathways. Humans may

Bioaccumulation of Pollutants in the Food Chain

Certain organic pollutants (such as PCBs and DDT) have two properties that lead to high bioaccumulation rates. These pollutants are hydrophobic (i.e., do not have an affinity to water) and thus attach to particles such as clay and small aquatic plants called phytoplankton. These organic pollutants are also lipophilic (i.e., have an affinity to lipids or fatty tissues) and are readily stored in fatty tissues of plants and animals. As a result, these pollutants biologically accumulate (bioaccumulate) in phytoplankton, sediment, and fat tissue at concentrations that exceed the pollutant concentrations in surrounding waters. In fact, the concentration in surrounding waters may be so low that they cannot be measured even by very sensitive methods.

Small fish and zooplankton (microscopic grazers) consume vast quantities of phytoplankton. In doing so, any toxic chemicals accumulated by the phytoplankton are further concentrated in the fish, especially in their fatty tissues. These concentrations are increased at each level in the food chain. This process of increasing pollutant concentration through the food chain is called biomagnification.



The top predators in a food chain, such as lake trout, coho and chinook salmon, and fish-eating gulls, herons, and bald eagles, may accumulate concentrations of a toxic chemical high enough to cause serious deformities or death or to impair their ability to reproduce. The concentration of some chemicals in the fatty tissues of top predators can be millions of times higher than the concentration in the surrounding water.

Eggs of fish-eating birds often contain some of the highest concentrations of toxic chemicals. Thus, the first apparent effects of a toxic chemical in a waterbody may be unhatched eggs or dead or malformed chicks. Scientists monitor colonies of gulls and other aquatic birds because these effects can serve as early warning signs of a growing toxic chemical problem.

Biomagnification of pollutants in the food chain is also a significant concern for human health. To protect their residents from these risks, states issue fish consumption advisories or warnings about eating certain types of fish or shellfish.

Source: Adapted from U.S. EPA, 1994, *The EPA Great Waters Program: An Introduction to the Issues and the Ecosystems*, EPA-453/B-94/030, Office of Air Quality Standards, Durham, NC.

be exposed to toxic chemicals if contaminated water is used as a source of drinking water without adequate treatment. Humans may also be exposed through the ingestion of aquatic life that lived in and ate organisms in contaminated water and sediments. Specifically, humans may be exposed to toxic chemicals by eating contaminated fish and shellfish. Because some toxic chemicals accumulate and concentrate in the tissue of fish and shellfish, consumption of contaminated tissue can sometimes pose a greater health risk than either drinking or swimming in contaminated water (see sidebar on bioaccumulation, page 192). The concentration of some toxic chemicals within fish and shellfish tissue may be up to 1 million times the concentration of toxicants in the surrounding water.

Waterborne viral and bacterial pollutants may also cause serious human illness and death. People can contract infectious hepatitis, gastroenteritis, dysentery, and cholera from waters receiving inadequately treated sewage. Bacteria and viruses may enter human systems through contact with contaminated swimming and bathing waters or through ingestion of contaminated drinking water or shellfish.

Fish and Wildlife Consumption Advisories

States and tribes issue fish and wildlife consumption advisories to protect the public from ingesting harmful quantities of toxic pollutants in contaminated noncommercial fish and wildlife. In general, advisories recommend that the public limit the quantity and frequency of consumption of fish and wildlife harvested from contaminated waterbodies. The states tailor individual advisories to minimize health risks based on contaminant data collected in their tissue sampling programs.

Advisories may completely ban consumption in severely polluted waters or limit consumption to several meals per month or year in cases of less severe contamination. Advisories may target a subpopulation at risk (such as children, pregnant women, or nursing mothers), specific fish species that concentrate toxic pollutants in their flesh, or larger fish within a species that may have accumulated higher concentrations of a pollutant over a longer lifetime than a smaller (i.e., younger) fish.

EPA evaluates the national extent of toxic contamination in noncommercial fish and shellfish by counting the total number of waterbodies with consumption advisories in effect. EPA used its database, the Listing of Fish and Wildlife Advisories (LFWA), to tabulate the number of state advisories. EPA built the database to centralize the fish consumption advisory information independently maintained by various state and tribal agencies. The database was updated by EPA in the spring of 1999. It can be accessed on the Internet at *http://www.epa.gov/ost/fish*.

The 1998 EPA LFWA listed 2,506 advisories in effect in 47 states, the District of Columbia, and American Samoa (Figure 8-1). An advisory may represent one waterbody or one type of waterbody within a state's jurisdiction.


Jessica Coffey, Grade 1, OH

Statewide advisories are counted as one advisory (see Appendix E, Table E-1, for individual state data).

EPA cannot identify states with a high proportion of toxic contamination based solely on the number of fish consumption advisories issued by each state. National statistics on advisories are difficult to interpret because the intensity and coverage of state monitoring programs vary widely. Each state can set its own criteria for issuing advisories. Simply comparing the total number of fish advisories in each state unfairly penalizes states with superior monitoring programs and strict criteria for issuing consumption warnings. In addition, it fails to present an equitable characterization of the number of fisheries affected and the severity of contamination problems.

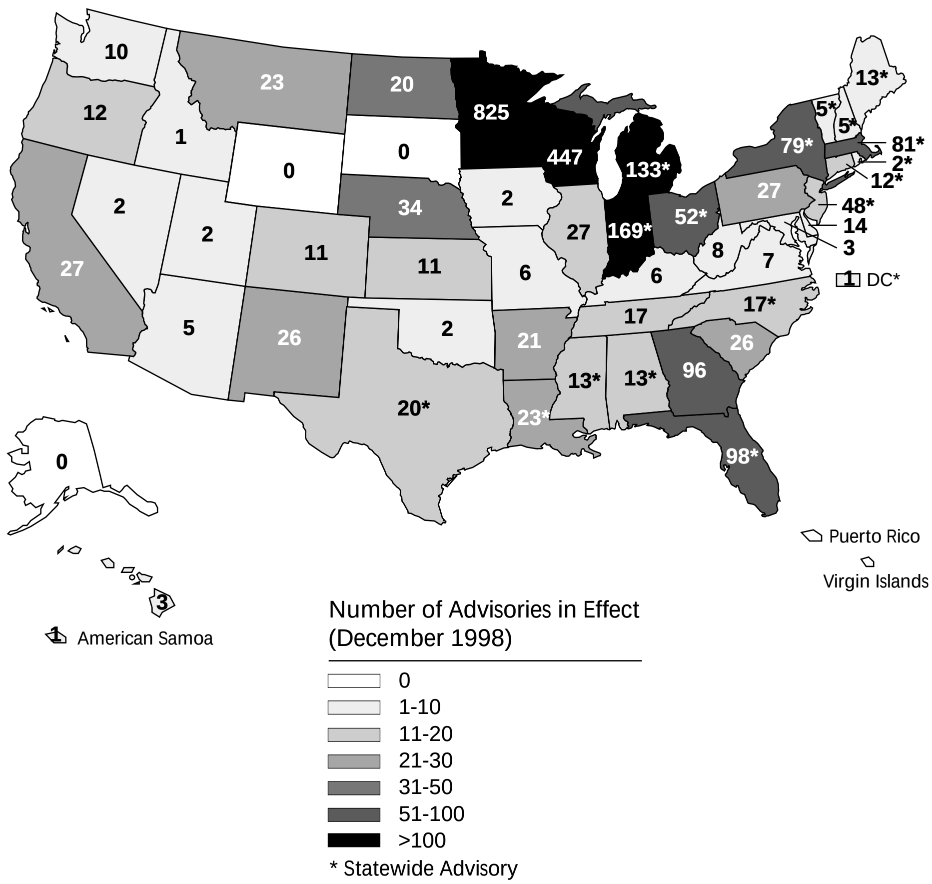
EPA has advocated consistent criteria and methods for issuing fish consumption advisories in several recent publications and workshops (see sidebar, page 195). However, it will be several years before the states implement consistent methods and criteria and establish a baseline inventory of advisories. EPA expects the states to issue more advisories as they sample more sites and detect contamination that previously went undetected.

Mercury, PCBs, chlordane, dioxins, and DDT (with its byproducts) caused 99% of all the fish consumption advisories in effect in 1998 (Figure 8-2). EPA and the states banned or restricted the use of PCBs, chlordane, and DDT over a decade ago, yet these chlorinated hydrocarbon compounds persist in sediments and fish tissues and still threaten public health.

During the 1990s, the states began reporting widespread mercury contamination in fish. As states expanded their tissue monitoring programs, they found elevated concentrations of mercury in fish inhabiting remote lakes that were previously considered unpolluted. States from Wisconsin

Figure 8-1

Fish and Wildlife Consumption Advisories in the United States



Note: States that perform routine fish tissue analysis (such as the Great Lakes states) will detect more cases of fish contamination and issue more advisories than states with less rigorous fish sampling programs. In many cases, the states with the most fish advisories support the best monitoring programs for measuring toxic contamination in fish, and their water quality may be no worse than the water quality in other states.

Based on data contained in the EPA Listing of Fish and Wildlife Advisories acquired from the states in December 1998 (see Appendix E, Table E-1, for individual state data).

to Florida reported widespread mercury contamination in fish collected primarily from lakes. The source of the mercury contamination is difficult to identify because mercury naturally occurs in soils and rock formations. Natural processes, such as weathering of mercury deposits, release some mercury into surface waters. However, resource managers believe that human activities have accelerated the rate at which mercury accumulates in our waters and enters the food web.

Air pollution may be the most significant source of mercury contamination in surface waters and fish. According to EPA's Toxics Release Inventory, almost all of the mercury released by permitted polluters enters the air; industries and waste treatment plants discharge very little mercury directly into surface waters. Emissions from waste incinerators, coal-fired plants, smelters, and mining operations may carry mercury many miles to remote watersheds (see sidebar on air pollution impacts on water quality, page 198). Other potential sources of mercury contamination include slag heaps from metal mines and land-disturbing activities that may mobilize natural mercury deposits, such as channelization, reservoir construction, and drainage projects.

Air emissions may further aggravate mercury contamination by generating acid precipitation that increases acidity in lakes. The accumulation of mercury in fish appears to correlate with acidity in a waterbody. Slightly acidic conditions promote the chemical conversion of mercury to a methylated form that is more readily available for uptake and accumulation in fish. States, such as Louisiana, are

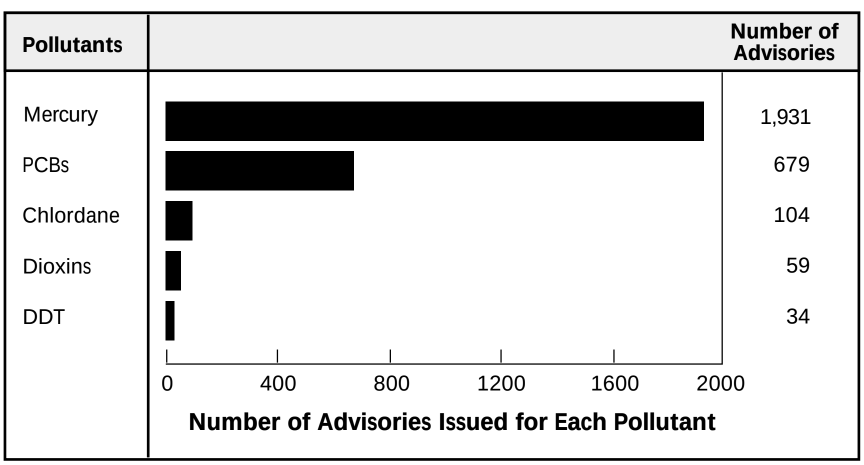
In 1990, EPA began developing technical guidance to help the states adopt consistent criteria and methods for issuing fish consumption advisories. The guidance consists of four volumes. EPA published volumes in 1993, 1994, 1995, and 1996 and second editions of two volumes in 1995 and 1997. Third editions of Volumes 1 and 2 are expected in 1999.

- *Volume I: Fish Sampling and Analysis* recommends standard methods for sampling and analyzing contaminants in fish tissue.
- *Volume II: Risk Assessment and Fish Consumption Limits* suggests protocols for selecting criteria for unsafe concentrations of contaminants in fish.
- *Volume III: Risk Management* suggests protocols for determining if the health risk justifies issuing an advisory.
- *Volume IV: Risk Communication* recommends methods for informing the public about fish consumption advisories.

The *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories* is available at *http://www.epa.gov/ost/fish*.

Figure 8-2

Pollutants Causing Fish and Wildlife Consumption Advisories in Effect in 1998



Based on data contained in Appendix E, Table E-2.

MERCURY is the most common contaminant found in fish.

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Survey of Mercury in State Fish Contaminant Monitoring Programs

The presence of mercury in fish tissue is increasingly an issue of public health concern for states. Of the more than 2,500 fish consumption advisories in effect in the United States in 1998, over 68% were related to mercury. Mercury contamination accounts for a significant fraction of the impaired waters in the United States.

Although 40 states currently have fish advisories in effect for mercury, until recently no national survey had been conducted to obtain information directly from states on the levels of mercury contamination in fish. In 1996, EPA solicited data on mercury concentrations in fish collected by the states as part of their fish contaminant monitoring programs. All states were asked to submit mercury residue data collected in their state waters from 1990 to 1995 so that EPA could assess whether there were geographic variations or trends in fish tissue concentrations of mercury nationally.

Exposure to mercury can permanently damage the brain, kidneys, and developing fetus.

EPA has assembled the data provided by 40 states and the District of Columbia. EPA's report, published in September 1999 (EPA823-R-99-014), summarizes these data and analyzes the geographic distribution of mercury in fish, mercury levels in various species of fish (see figure), and factors contributing to mercury contamination.

The most commonly sampled fish species were the largemouth and smallmouth bass; channel, flathead, and blue catfish; yellow and brown bullhead; rainbow and lake trout; carp; walleye; northern pike; and white sucker.

The fish species with the broadest geographic distribution nationally was the largemouth bass, which was collected and analyzed by 25 of the 39 reporting states. The maximum mercury concentration reported for this species exceeded the Food and Drug Administration action level (1 ppm) in 15 of the 25 states that analyzed tissue from this species. The highest maximum mercury concentration

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for this species nationally (4.36 ppm) was reported by Florida. Consumption of contaminated fish harvested from local waters exposes high-end fish consumers to potentially greater risk of mercury exposure than members of the general population. The populations most at risk because of their consumption of locally caught fish are ethnic populations, such as Native Americans, Caribbean Americans, and Asian Americans, and recreational sport and subsistence fishers.

Concentration Ranges for Selected Species

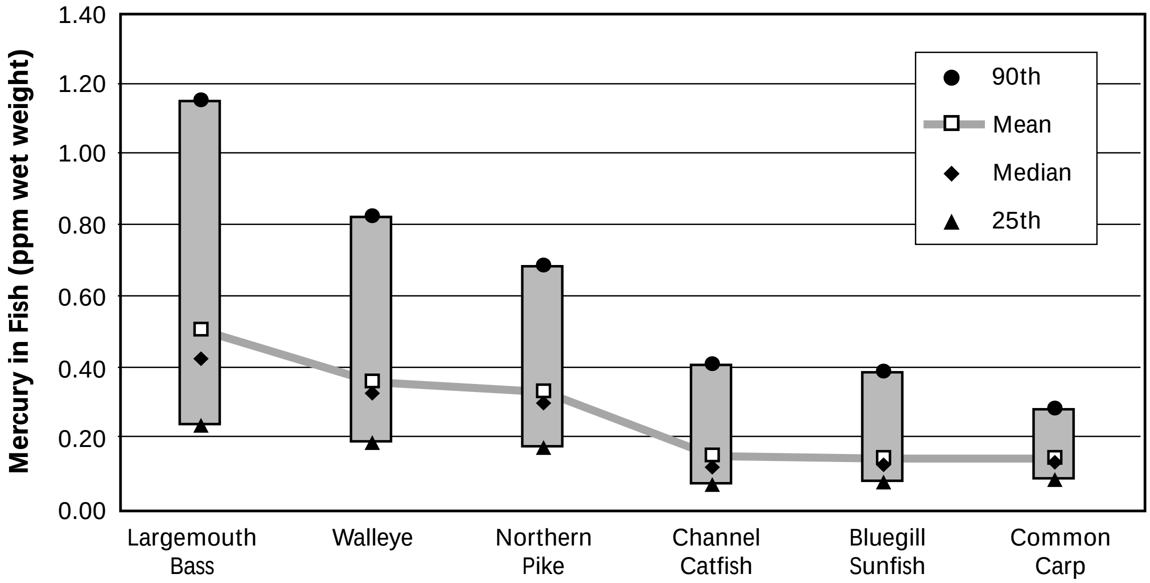


Figure 1. Mercury accumulates up the food chain from bottom feeders such as carp and catfish to top predator game fish such as bass and walleye.

Air Pollution Impacts on Water Quality

Sources

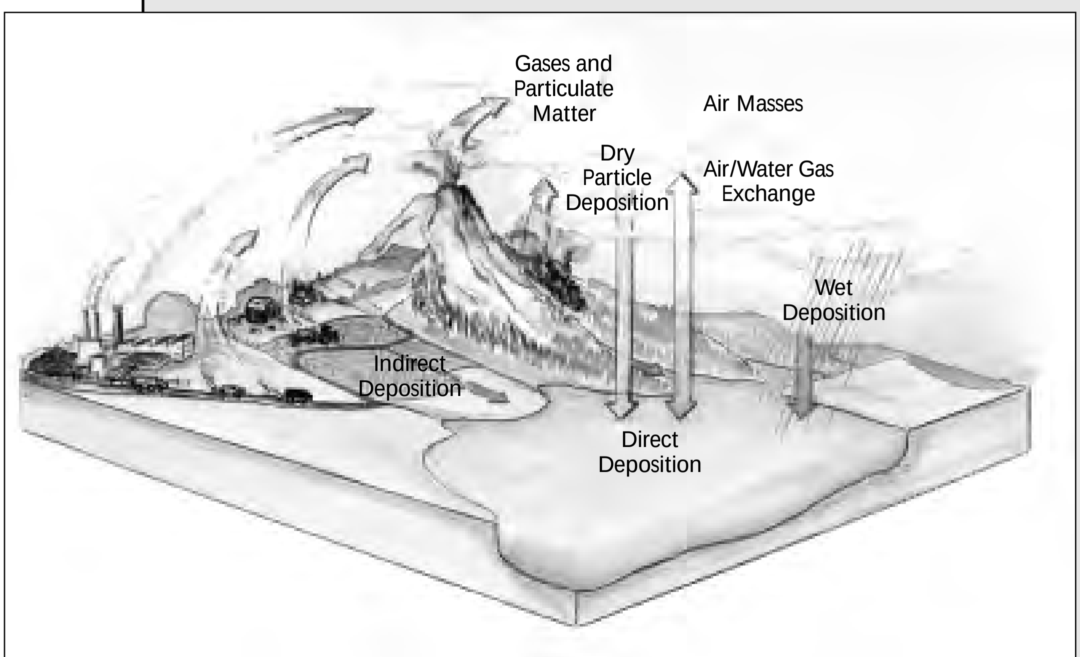
Pollutants are released into the air from anthropogenic or natural sources. Anthropogenic sources include industrial stacks, municipal incinerators, pesticide applications, and vehicle exhaust. Natural sources can be volcanic eruptions, windblown gases and particles from forest fires, windblown dust and soil particles, and sea spray.

Transport

Pollutants released to the air are carried by continental wind patterns away from their areas of origin. Depending on weather conditions and the chemical and physical properties of the pollutants, they can be carried varying distances from their sources and can undergo physical and chemical changes as they travel.

Deposition

Air pollutants are deposited to the earth or directly to waterbodies by either wet or dry deposition. Wet deposition occurs when pollutants are removed from the air by falling rain or snow. Dry deposition occurs when particles settle out of the air by gravity or when gases are transferred directly from the air into water. Air pollutants that deposit on land can be carried into a waterbody by stormwater runoff. This is called indirect deposition.



Sophie Burkheimer, RTI

Source: Adapted from U.S. EPA, 1994, *The EPA Great Waters Program: An Introduction to the Issues and the Ecosystems*, EPA-453/B-94/030, Office of Air Quality Planning and Standards, Durham, NC.

using this correlation to target waterbodies with acidic pH and low buffering capacity for mercury sampling in fish.

The EPA LFWA database does not identify sources of contamination in fish. Sources of contamination are difficult to isolate because migratory fish may be exposed to toxic pollutants in the sediments and water column or may ingest toxic contaminants concentrated in prey miles from the sampling areas where they are collected. Furthermore, migratory or resident fish may be exposed to toxic pollutants that have been transported great distances from where they originated.

Shellfish Contamination

Contaminated shellfish pose a public health risk particularly to those who consume raw shellfish. Shellfish, such as oysters, clams, and mussels, extract their food (plankton) by filtering water over their gills. In contaminated waters, shellfish accumulate bacteria and viruses on their gills and mantle and within their digestive systems. If shellfish grown in contaminated waters are not cooked properly, consumers may ingest live bacteria and viruses.

To protect public health, the U.S. Food and Drug Administration administers the National Shellfish Sanitation Program (NSSP). The NSSP establishes minimum quality monitoring requirements and criteria for state shellfish programs that want to participate in interstate commerce of shellfish. States cannot sell shellfish outside of their state boundaries unless their shellfish sanitation program follows NSSP protocols.

Coastal states routinely monitor shellfish harvesting areas for bacterial contamination and restrict shellfish harvests in contaminated waters. Most often, states measure concentrations of fecal coliform or total coliform bacteria, which are bacteria that populate human digestive systems and occur in fecal wastes. Their presence in water samples is an indicator of sewage contamination that may pose a human health risk from pathogenic viruses and bacteria. Fecal bacteria, however, may exceed criteria even when no human sewage is present because birds and nonhuman mammals also excrete them.

The NSSP recognizes three types of shellfish harvesting restrictions:

- **Prohibited Waters** violate criteria consistently; therefore, shellfish cannot be harvested at any time.
- **Restricted Waters** may be harvested if the shellfish are transferred to clean waters to reduce concentrations of bacteria.
- **Conditionally Approved Waters** temporarily exceed bacteriological criteria following predictable events (such as a storm). Shellfish from these waters may be harvested when criteria are met.

The size of waters with shellfish harvesting restrictions does not equate with the size of polluted estuarine waters because states sometimes restrict harvesting in clean waters. The NSSP requires that a state prohibit shellfishing in clean waters if the state cannot monitor a waterbody on a routine schedule that ensures rapid detection of unsafe conditions. As a

> The National Shellfish Sanitation Program addresses only bacteriological contamination of molluscan (not crustacean) shellfish that are harvested for sale in interstate commerce. The Listing of Fish and Wildlife Advisories addresses only chemical contamination of shellfish (all types) that are harvested for all purposes.

result, funding for monitoring activities can raise or lower the size of waters classified as "prohibited" even if water quality does not change. Georgia, for example, reported in 1994 that funding for a new laboratory position during 1992 and 1993 restored shellfishing to clean waters previously classified as "prohibited" due to a lack of monitoring.

As a preventive measure, the states also automatically prohibit the harvest of shellfish near marinas and pipes that discharge wastewater. These closures protect the public from accidental releases of contaminated wastewater due to treatment plant malfunctions or overflows during severe weather. The preventive closures apply to marinas because fecal bacteria concentrations may increase during high-use periods, such as weekends. The states prohibit shellfishing in these waters even though these waters may not contain harmful concentrations of fecal bacteria most of the time.

Table 8-1. Shellfish Harvesting Restrictions Reported by the States

State	Number of Waterbodies with Restrictions	Size (square miles)
Alabama	—	—
Alaska	—	—
California	—	—
Connecticut	—	—
Delaware	—	—
Delaware River Basin	—	97.0
District of Columbia[a]	—	—
Florida	—	—
Georgia	—	395.0
Hawaii	0	0
Louisiana	26	—
Maine	—	—
Maryland	37	171.2
Massachusetts	12	541.7
Mississippi	—	—
New Hampshire	11	16.8
New Jersey	—	254.0
New York	—	312.5
North Carolina	—	—
Oregon	7	58.0
Puerto Rico	—	—
Rhode Island	39	66.5
South Carolina	122	266.5
Texas	—	—
Virginia	—	146.0
Virgin Islands	—	—
Washington	—	—
Totals	254	2,325.1

[a] The District of Columbia prohibits commercial harvest of shellfish in all of its waters.

Source: 1996 state Section 305(b) reports.

— Not reported in a numerical format.

Despite these drawbacks, the size of waters with shellfishing restrictions is our most direct measure of impacts on the shellfishing resource (Table 8-1). However, only 12 of the 28 coastal states and territories and 1 interstate commission reported the size of their estuarine waters affected by shellfish harvesting restrictions. With so few states reporting numerical data, EPA cannot summarize the national scope of shellfish harvesting conditions at this time. The National Oceanic and Atmospheric Administration is developing a database to track state restrictions that should provide a more complete profile of shellfishing conditions in the future.

The reporting states prohibit, restrict, or conditionally approve shellfish harvesting in 2,325 square miles of estuarine waters. About 14% of these waters are conditionally approved, so the public can harvest shellfish from these waters when the state lifts temporary closures. For comparison, nine states reported that over 7,000 square miles of estuarine waters are fully approved for harvesting shellfish at all times (Appendix E, Table E-3, contains individual state data).

Only eight states reported the size of shellfish restrictions caused by specific sources of pathogen indicators (Figure 8-3). Other states provided narrative information about sources degrading shellfish waters. For example, Louisiana reported that sewage treatment plant upgrades improved shellfish harvesting areas, but environmental changes that are causing negative impacts include nonpoint source pollution, sewage from camps, saltwater intrusion, and marsh erosion.

Drinking Water Source Assessments

The Safe Drinking Water Act (SDWA) calls for states to determine the susceptibility of waters to contamination, while Section 305(b) of the Clean Water Act calls for them to assess the ability of waters to support drinking water use. States may prioritize their water resources and perform drinking water use support assessments for a limited percentage of their water resources. They are then encouraged to expand their drinking water assessment efforts to include additional waters at each subsequent reporting cycle. EPA recommends prioritization based on waters of greatest drinking water demand, with further prioritization with respect to vulnerability or other state priority factors. In addition, states are encouraged to use a tiered approach in the assessment. This tiered approach accommodates the different types of data currently available to states and allows for differing levels of assessment.

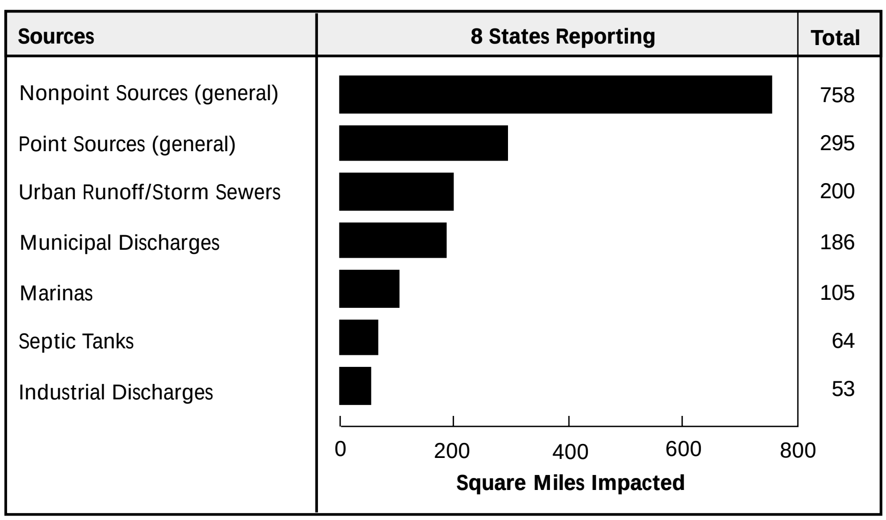
States use the general criteria outlined in Table 8-2 to determine the degree of drinking water use support for waterbodies in their state. These criteria may be modified by the states to fit their individual situations.

Summary of State Drinking Water Assessments

Thirty-eight states, tribes, or territories submitted drinking water use data in their reports. Figure 8-4 shows which states submitted drinking water data for rivers and streams and/or lakes and reservoirs. Table 8-3 shows the total number of miles of rivers and streams and

Figure 8-3

Sources Associated with Shellfish Harvesting Restrictions



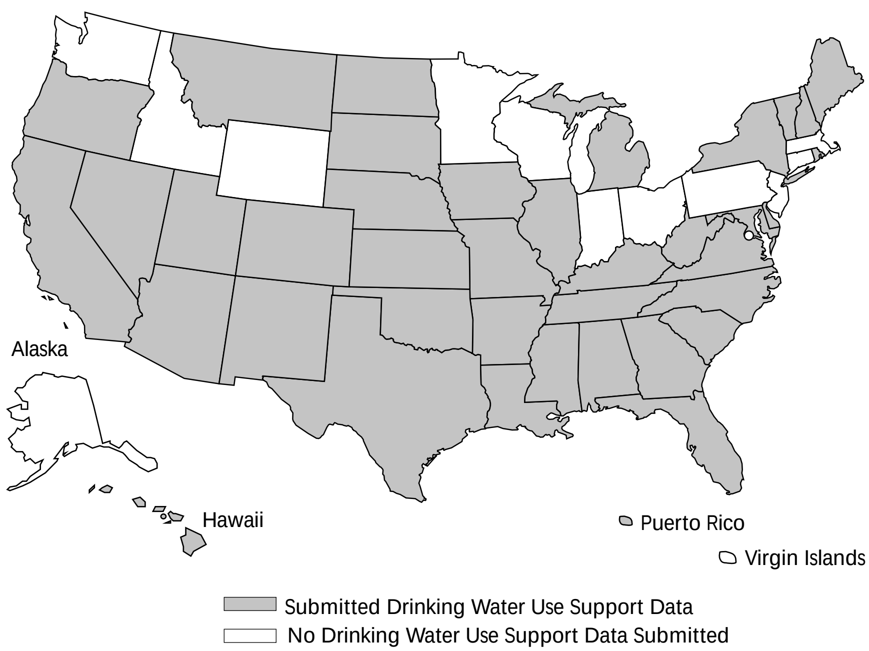
Based on data contained in Appendix E, Table E-4.

Table 8-2. Criteria to Determine Drinking Water Use Support

Classification	Monitoring Data		Use Support Restrictions
Full support	Contaminants do not exceed water quality criteria	and/or	Drinking water use restrictions are not in effect
Full support but threatened	Contaminants are detected but do not exceed water quality criteria	and/or	Some drinking water use restrictions have occurred and/or the potential for adverse impacts to source water quality exists
Partial support	Contaminants exceed water quality criteria intermittently	and/or	Drinking water use restrictions resulted in the need for more than conventional treatment
Nonsupport	Contaminants exceed water quality criteria consistently	and/or	Drinking water use restrictions resulted in closures
Unassessed	Source water quality has not been assessed		

Figure 8-4

States Submitting Drinking Water Use Support Data in Their 305(b) Reports



Source: 1998 305(b) reports submitted by states.

acres of lakes and reservoirs assessed and the degree of drinking water use support for the entire nation. The majority of waterbodies assessed, 87% of rivers and streams and 82% of lakes and reservoirs, are fully supporting of drinking water use. Only 3% of assessed rivers and streams and 5% of lakes and reservoirs do not support drinking water use.

A large improvement was seen between the drinking water use support data reported by the states in the 1998 305(b) report and that reported previously. In the early 1990s, only a small percentage of rivers, streams, lakes, and reservoirs were assessed for drinking water use. For the 1996 305(b) report, EPA developed guidelines for states to use in assessing drinking water use support. These guidelines were modified for the 1998 report to provide more flexibility to the states. It is evident that this has resulted in an increasing number of states carrying out drinking water use assessments. In addition, more states reported on how they classified waterbodies for drinking water use and on sources of water contamination. The increased data available from these assessments results in a more accurate framework for assessing drinking water use support in the nation.

However, many challenges still remain. Twelve states did not report data on drinking water use support. Many of the 38 states that reported data did not present any information on how they classified their waterbodies for drinking water use support or on sources of water contamination. This lack of information complicates data interpretation and presents challenges for accurately assessing and representing drinking water use support.

Sources of Drinking Water Use Impairment

Because of the flexibility of the guidelines for assessing drinking water use impairment, each state analyzed for different contaminants and used different criteria for assessing drinking water use impairment. In addition, many states did not identify the particular contaminants that caused drinking water use impairment. Thus, it is not possible to present quantitative data on this issue. However, based on the limited number of states identifying contaminants, Table 8-4 summarizes all of the contaminants cited as causing drinking water use impairment.

Ensuring Safe Drinking Water

Thanks to decades of effort by public and private organizations and the enactment of drinking water legislation, most Americans can turn on their taps without fear of receiving unsafe water. Ensuring consistently safe drinking water requires the cooperation of federal, state, tribal, and municipal governments to protect the water as it moves through three stages of the system—the raw source water, the water treatment plant, and the pipes that deliver finished water to consumers' taps. Polluted source waters greatly increase the level and expense of treatment needed to provide finished water that meets public health standards.

The passage of the SDWA Amendments of 1996 brought substantial changes to the national drinking water program for water utilities, states, and EPA, as well as greater protection and information to the 240 million Americans served by public water systems. The Amendments increased state flexibility, provided for more efficient investments by water systems, gave better information to consumers, and strengthened EPA's scientific work in setting drinking water standards.

Table 8-3. National Drinking Water Use Support

	Fully Supporting	Threatened	Partially Supporting	Not Supporting	Total Assessed
Rivers and Streams					
Miles	122,318	5,844	8,164	4,616	140,954
Percentage	87	4	6	3	—
Lakes and Reservoirs					
Acres	6,926,031	303,374	794,573	394,307	8,418,286
Percentage	82	4	9	5	—

Table 8-4. Sources of Drinking Water Use Impairment

Contaminant Group	Specific Contaminant	
Pesticides	Atrazine Metolachlor Triazine	Molinate Ethylene dibromide
Volatile organic chemicals	Trichloroethylene Tetrachloroethylene 1,1,1-Trichloroethane *cis*-1,2-Dichloroethylene Trihalomethanes Carbon tetrachloride Ethylbenzene 1,1,2,2-Tetrachloroethane	Dichloromethane 1,1-Dichloroethane 1,1-Dichloroethylene Toluene Benzene Dichlorobenzene Methyl(tert)butyl ether Xylene
Inorganic chemicals	Arsenic Nitrates Iron Copper Chloride	Fluoride Manganese Lead Sodium
Microbiological contaminants	Exceedance of total coliform rule	Exceedance of fecal coliform rule

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Protecting Sources of Drinking Water

Introduction

In the United States today, approximately 11,000 community water systems serving over 160 million people rely on lakes, reservoirs, and rivers as their main sources of drinking water. There is a growing recognition that addressing the quality and protection of these water sources can prevent contamination, thus reducing costly additional treatment and cleanup. Across the country, drinking water utilities are engaged in innovative and successful source water protection programs. These programs rely heavily on partnerships with local governments and often involve working closely with watershed councils, entering into land exchange agreements with land management agencies, and engaging with local farmers to implement best management practices aimed at protecting sources of drinking water.

The local actions that help protect sources of drinking water can generally be classified as: (1) creating partnerships, (2) assessing watersheds, (3) managing land use in watersheds, and (4) acquiring land.

Creating Partnerships

Instituting drinking water protection with a source water protection program involves balancing competing interests and conflicting demands within the watershed. This can be done through watershed planning committees or simply by establishing good, long-term relationships among the partners, which encourages a level playing field for reconciling the community's needs. It is important for affected parties—water utilities, local and state governments, watershed councils, nongovernment organizations, and others—to share information effectively.

Example: Creating Partnerships with Groups and Individuals, Chester Water Authority, Chester, Pennsylvania

To protect the water quality of its Octoraro Reservoir, the Chester Water Authority has forged a strong and lasting partnership with the Octoraro Watershed Association. This partnership bridges the gap between the citizens who get their drinking water from the Octoraro

Reservoir but do not live in the watershed and the farmers and landowners who live in the watershed but do not get their drinking water from the reservoir. The Chester Water Authority and the Octoraro Watershed Association have jointly supported many education and outreach programs, and the Authority has provided a meeting place and administrative support services to the Association. The Association promotes agricultural best management practices (BMPs) such as streambank fencing, barnyard management, crop rotation, and the establishment of forested riparian buffers throughout the watershed. One of the Association's greatest challenges has been convincing farmers that the BMPs will benefit both them and the watershed. Sharing success stories is often a successful way to garner support for BMP implementation. The Association also helps willing farmers seek financial aid for their BMPs. Funds are often available from local, state, and federal partners.

Assessing Watersheds

One of the keys to a strong watershed protection program is the assessment of the area. It is important to be able to identify watershed problems and target protection efforts. Watershed delineation and assessment are tools used to achieve these goals. Many water utilities use geographic information systems (GIS) to delineate their watersheds. Afterwards, local managers can use zoning maps to identify land use patterns within the watersheds and identify potential sources of contamination that pose the greatest threats to the drinking water supply. A comprehensive monitoring plan is also useful for identifying watershed problems.

Example: Monitoring Data to Support Protective Water Quality Standards, Portland Water Bureau, Portland, Oregon

The Portland Water Bureau draws its water from the Bull Run River in the Mt. Hood National Forest. The U.S. Forest Service (USFS) administers the watershed under several legal authorities including the Bull Run Management Act (P.L. 95-200). This act sets the production of pure, clean, raw, potable

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water as the principal federal management objective for the area. Consequently, the USFS must adopt standards specific to the Bull Run watershed that are more stringent than its national standards. The USFS, the Portland Water Bureau, and the U.S. Geological Survey share the monitoring responsibilities of sampling, data collection and analysis, and database management. Monitoring is critical to unfiltered water systems, serving as an early warning of turbidity-producing events such as landslides and storm-induced erosion. By tracking turbidity levels during and after these events, facility operators can either divert heavily contaminated waters or temporarily switch to an alternative ground water source. The Portland Water Bureau is also using the monitoring program to estimate the sediment loading from abandoned roads in the national forest.

Managing Land Use in Watersheds

The type of land use in a drinking water supply source area, whether it is rural, urban, forested, and/or farmed, presents a challenge to managing the water source. Utilities whose water sources are in a forested area usually must contend with logging, erosion, and timber management. Systems whose sources are in rural or suburban areas may need to deal with septic systems, agricultural runoff, and erosion or recreational uses such as swimming, hiking, and mountain biking. In urban areas, utilities need to address issues such as storm water drainage, runoff from pavement, and increasing development. Solutions to the pollution from these various land uses range from simple, creative ideas that other systems can easily adopt, to capital-intensive projects that require significant funding commitments.

Example: Managing Urban Storm Water, Massachusetts Water Resources Authority, Boston, Massachusetts

Pollutant runoff from construction sites after large rainfall events can stress drinking water treatment facilities. Although the Massachusetts Water Resources Authority does not regulate storm water releases from construction sites, the Metropolitan District Commission (MDC) Division of Watershed Management works with petitioners to review all plans for the design and construction of storm water and erosion control projects. These control projects are required under the state's Watershed Protection Act and Wetlands Protection Act. In addition to reviewing plans, annual watershed sanitary surveys help MDC staff identify areas of concern. Once a specific threat to human health is identified, the MDC works with the responsible party to mitigate the situation. In the future, MDC plans to analyze pollutant loading at the subbasin level and recommend

BMPs. The Massachusetts Water Resources Authority and MDC plan to conduct workshops to help municipalities implement the BMPs and may provide technical and financial assistance.

Acquiring Land

One way to solve the problem of competing land uses within a watershed is to acquire all the land surrounding a water source. Rather than negotiate with individual landowners, the system buys the land surrounding a surface water source. This solution is simple, yet often difficult to implement.

Example: Land Acquisition Program Targets High-Priority Parcels, New York City Department of Environmental Protection, New York, New York

New York City's water utility, the Department of Environmental Protection (DEP), has embarked on a 10-year program of land acquisition within its watersheds. DEP has committed $250 million to acquire property associated with the Catskill and Delaware River supply systems. These supplies spread over 1,600 square miles west of the Hudson River and provide 90% of New York City's water. An additional $10 million has been set aside for the same purpose in the Croton Watershed, which lies east of the Hudson. This program operates under a 10-year water supply permit from the New York State Department of Environmental Conservation (NYSDEC) issued in 1997. This permit enables DEP to acquire, through purchase or conservation easements, undeveloped land near reservoirs, wetlands, and watercourses, as well as land with other features sensitive to water quality. No land will be taken through eminent domain, and fair market value is paid for all land. The watersheds have been divided into priority areas for acquisition, based on natural features and proximity to reservoirs, intakes, and DEP's distribution system.

Conclusions

The examples provided here are just a sampling of local actions being taken across the country to protect sources of drinking water. The common thread among the examples is the coordination of a drinking water utility's goals with local watershed management initiatives aimed at aquatic ecosystem restoration and protection.

This highlight was drawn from *Protecting Sources of Drinking Water: Selected Case Studies in Watershed Management* (EPA 816-R-98-019, April 1999). For more information on EPA's efforts to protect drinking water sources, visit the Office of Ground Water and Drinking Water on the Internet at *http://www.epa.gov/ogwdw/protect.html*.

Drinking Water Standards

EPA sets national primary drinking water standards through the establishment of maximum contaminant levels (MCLs) and through treatment technique requirements.

MCLs are the maximum permissible levels of contaminants in drinking water that is delivered to any user of a public water system. The MCLs provide enforceable standards that protect the quality of the nation's drinking water.

Treatment techniques are procedures that public water systems must follow to ensure a contaminant is limited in the drinking water supply. EPA is authorized to establish a treatment technique when it is not economically or technically feasible to ascertain the level of a contaminant.

Source Water Protection

The SDWA Amendments establish a strong new emphasis on preventing contamination problems through source water protection and enhanced water system management. The states are central in creating and focusing prevention programs and helping water systems improve their operations to avoid contamination problems. States are assessing the susceptibility to contamination of the source waters supplying public water systems. These assessments will provide the information necessary for states to develop tailored monitoring programs and for water systems to seek help from states in protecting source water or initiating local government efforts.

Better Consumer Information/Right-to-Know

The consumer information provisions of the SDWA Amendments herald a new era of public involvement in drinking water protection. Community water systems are required to send customers an annual report with information on their drinking water quality. Each report must provide the following information about their drinking water:

- The lake, river, aquifer, or other source of the drinking water
- A brief summary of the susceptibility of the local drinking water source, based on the source water assessments that states are completing over the next 4 years
- How to get a copy of the water system's complete source water assessment
- Level (or range of levels) of a contaminant found in local drinking water, as well as EPA's MCL for comparison
- Likely source of that contaminant in the local drinking water supply
- Potential health effects of any contaminant detected in violation of EPA's MCL and an accounting of the system's actions to restore safe drinking water
- The water system's compliance with other drinking-water-related rules.

This rule will affect 55,000 water systems, and the information in the reports will reach 248 million people nationwide. Large water systems will mail the water quality reports to their customers, either with water bills or as a separate mailing, and will take steps to get the information to people who do not receive water bills. Smaller water systems may be able to distribute the information through newspapers or by other means.

Regulatory Improvements

Recognizing that responsible flexibility, good science, and a better prioritization of effort could improve protection of public health, the 1996 SDWA Amendments established a new process for regulating drinking water contaminants.

- **New risk-based contaminant selection.** This list establishes priorities for EPA's drinking water program (Table 8-5). EPA published the Drinking Water Contaminant Candidate List (CCL) in the March 2, 1998, *Federal Register* (63 FR

10273). It includes 61 contaminants divided among three categories:

- Priorities for additional research
- Priorities for additional occurrence data
- Priorities for consideration for rulemaking.

■ **Occurrence Information.** The collection, organization, and ready availability of contaminant occurrence data are taking on unprecedented importance. EPA has established both a National Drinking Water Contaminant Occurrence Database (NCOD) and an Unregulated Contaminant Monitoring Regulation, as required by the SDWA amendments.

■ **Cost-Benefit Analysis and Research for New Standards.** Regulations now formalize that in developing all future drinking water standards, EPA must conduct a cost-benefit analysis, provide comprehensive and understandable information to the public, and use the best available peer-reviewed science and supporting studies.

■ **Disinfection Byproduct/ *Cryptosporidium*.** Microbial pollutants in drinking water may cause acute gastrointestinal problems. Yet some disinfection processes that reduce microbial contaminants create disinfection byproducts. To strengthen control of microbial pathogens, disinfectants, and disinfectant byproducts in drinking water, EPA is developing a group of interrelated regulations referred to as the microbial disinfection byproduct rules. These rules are intended to address risk trade-offs between the different types of contaminants and to address the waterborne pathogen, *Cryptosporidium*.

A Stage 1 Disinfectants/Disinfection Byproducts Rule and an Interim Enhanced Surface Water Treatment Rule were promulgated in December 1998. The Stage 1 Disinfectants/Disinfection Byproducts Rule establishes maximum residual disinfectant level goals and maximum residual disinfectant levels for chlorine, chloramine, and chlorine dioxide. It also establishes MCL goals and MCLs for total trihalomethanes, haloacetic acids, chlorite, and bromate.

EPA also issued an Interim Enhanced Surface Water Treatment Rule in 1998. It includes treatment requirements for *Cryptosporidium* and filter turbidity monitoring provisions.

Drinking Water State Revolving Fund

The creation of a Drinking Water State Revolving Fund (DWSRF) program to assist communities in installing and upgrading safe drinking water treatment facilities is one of the more important additions to the nation's drinking water program.

All states have received EPA funding to establish their DWSRF

> The new amendments offer a unique incentive for water utilities and groups devoted to watershed protection to form partnerships and explore their common ground. After all, the goals of one group often affect the goals of the other. For instance, water utilities generally strive to keep treatment costs down, while watershed groups typically look for ways to address sources of contamination. Identifying such common pursuits stands to benefit everyone and, ultimately, the future of the nation's watersheds.

Table 8-5. Regulatory Subset List of the CCL

Chemical or Microbial Contaminant		
Acanthamoeba (guidance)	Boron	Metribuzin
1,1,2,2-Tetrachloroethane	Bromobenzene	Naphthalene
1,1-Dichloroethane	Dieldrin	Organotins
1,2,4-Trimethylbenzene	Hexachlorobutadiene	Triazines and degradation products
1,3-Dichloropropane	*p*-Isopropyltoluene	Sulfate
2,2-Dichloropropane	Manganese	Vanadium
Aldrin	Metolachlor	

programs. The program gives states the authority to use a portion of their DWSRF resources to support new prevention programs. States are encouraged to place a high priority on use of funds for activities aimed at protection of drinking water by preventing contaminants from entering sources of drinking water.

Drinking Water Concerns

Over 90% of people in the United States get their drinking water from public water supplies. Although most public water supplies meet drinking water standards, a diverse range of contaminants can affect drinking water quality. EPA's Science Advisory Board concluded that drinking water contamination is one of the greatest environmental risks to human health. This conclusion is due, in part, to the variability in quality of the source of water supplying the drinking water. It is also due to the potential for contamination in the delivery system as the water travels from the treatment plant to the consumer's tap.

Under the Safe Drinking Water Act, a public water system is defined as a system that has at least 15 service connections or serves an average of at least 25 people for at least 60 days per year. There are three types of public water systems:

- Community water systems are those that serve the same people year-round (e.g., cities, towns, villages, and mobile home parks).
- Nontransient noncommunity water systems are those that serve at least 25 of the same people for at least 6 months of the year (e.g., schools, day care centers).
- Transient noncommunity water systems are those that serve transient populations (e.g., rest stops, campgrounds, and parks).

In 1998, 89% of the population served by community water systems received water that had no reported health violations (Figure 8-5). Of the 54,367 community water systems, 9% reported MCL or treatment technique violations. These systems served nearly 30 million people.

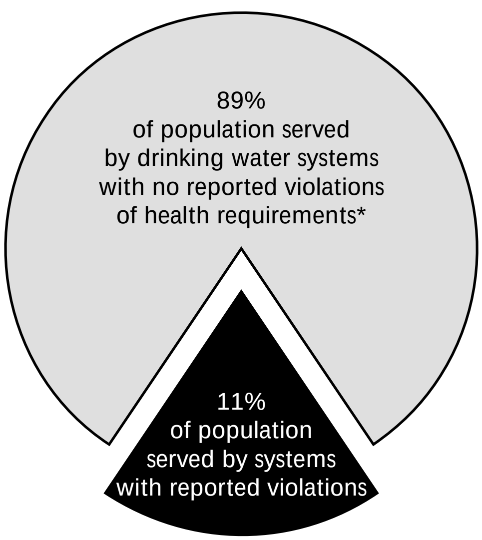
For all public water systems in 1998, there were 15,832 MCL or

Figure 8-5

Compliance of Community Drinking Water Systems with Health Requirements in 1998

Population served by community drinking water systems in 1998 = 253 million

Number of community drinking water systems = 54,367



As much as one-fourth of the community water systems did not complete all required monitoring. The compliance status of some of those could not be assessed from the data reported.

Source: U.S. EPA, 1999, Office of Ground Water and Drinking Water, Washington, DC.

treatment technique violations reported by 9,788 of the 170,376 systems. Most of these violations were in small systems.

The greatest risk from unsafe drinking water is exposure to waterborne pathogens, which can cause acute health problems requiring medical treatment. As shown in Figure 8-6, bacteria, viruses, parasitic pathogens, and chemical agents have all been shown to cause waterborne disease outbreaks.

For systems serving a large population, a waterborne disease outbreak can sharply impact a large number of people. The 1993 *Cryptosporidium* outbreak in Milwaukee, for example, affected more than 400,000 people, the largest waterborne disease outbreak ever reported in the United States.

Recreational Restrictions

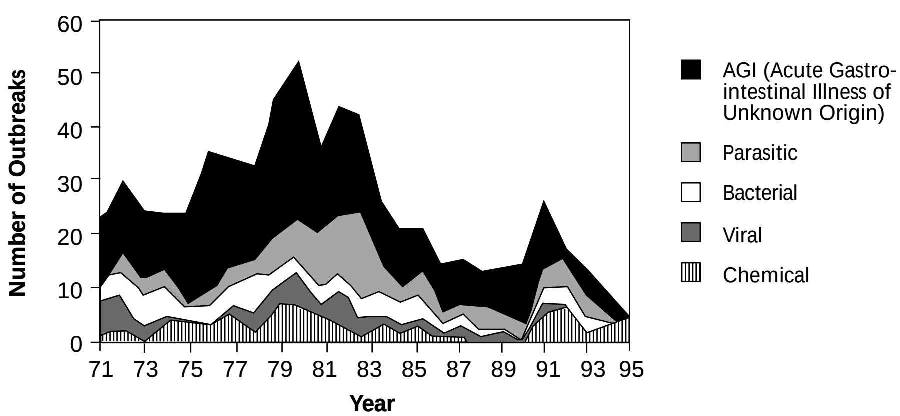
State reporting on recreational restrictions, such as beach closures, is often incomplete because most state agencies rely on local health departments to voluntarily monitor and report beach closures. Most state agencies that prepare the 305(b) reports do not have access to an inventory of beach closures. The information obtained varies in quality because health departments that monitor infrequently will detect fewer bacteria violations than health departments with rigorous beach monitoring schedules.

Nine states reported that there were no contact recreation restrictions reported to them during the 1998 reporting cycle. Sixteen states and tribes identified 240 sites where recreation was restricted at least once during the reporting cycle (Appendix E, Table E-6, contains individual state data). Local health departments closed many of these sites more than once. Pathogen indicator bacteria caused most of the restrictions. Other contaminants cited include syringes found on beaches, toxics in seaweed, floating mats of vegetation, and pollutants in urban runoff.

The states identified sewage treatment plant bypasses and malfunctions, urban runoff storm sewers, and faulty septic systems as the most common sources of elevated bacteria concentrations in bathing areas. The states also reported that natural sources and

Figure 8-6

Waterborne Outbreaks in the United States by Year and Type



Source: Levy et al., 1998, Morbidity and mortality surveillance summaries. *Surveillance for Waterborne Disease Outbreaks*, Centers for Disease Control, Atlanta, GA, V. 47(SS-5): 1-34. *http://www.cdc.gov/epo/mmwr*

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The Clean Water Action Plan and Public Health Protection

The Clean Water Action Plan (CWAP) contains several key action items designed to improve public health protection. Some of the specific actions call for increased effort to ensure that fish and shellfish are safe to eat. Federal agencies are working with states and tribes to expand programs to reduce contaminants that can make locally caught fish and shellfish unsafe to eat—particularly mercury and other persistent, bioaccumulative toxic pollutants—and to ensure that the public gets clear notice of fish consumption risks. Another main component is to ensure safe beaches. To achieve this goal, federal, state, and local governments will work to improve the capacity to monitor water quality at beaches, develop new standards, and use new technologies, such as the Internet, to report public health risks to recreational swimmers.

Actions to Reduce Fish and Shellfish Consumption Health Risks

In 1998, 2,506 public advisories restricting the consumption of locally caught fish were in effect. States and tribes issue advisories to notify and protect their citizens from unsafe levels of contaminants in fish tissue that make the fish unsafe to eat or unsafe to eat in large quantities. Numerous inland rivers and lakes, all of the Great Lakes and their connecting waters, a large portion of the nation's coastal waters, and about 20% of the national wildlife refuges with permissible fishing are under fish consumption advisories.

EPA is promoting consistent methodologies for state and local public health officials to use in issuing or rescinding advisories for specific chemical residues, fish species, and human population groups at risk. Technical handbooks and public information brochures can be ordered through a special EPA website devoted to fish and shellfish consumption advisory issues located at *http://www.epa.gov/OST/fish/*. The EPA website allows users to access a special database that includes all available information describing state-, tribal-, and federally issued fish consumption advisories in the United States for the 50 states, District of Columbia, four U.S. territories, and the 12 Canadian provinces and territories. These advisories inform the public that high concentrations of chemical contaminants have been found in local fish and wildlife, and they include recommendations to limit or avoid consumption of certain fish and wildlife species. EPA has upgraded this Listing of Fish and Wildlife Advisories database for interactive queries and mapping using Internet web browsers. The database has been enhanced to include information on the actual levels of the major pollutants in fish tissue that can trigger advisories. Tissue chemical residue data have been included at sites where advisories have been issued, as well as other areas showing very low levels of contamination. Watershed-oriented analysis of such tissue residue data may help define relatively "clean areas" where the public could be encouraged to fish with minimal risks.

EPA is conducting research to more accurately quantify and predict the sources, transport, fate, and exposure risks for major pollutants that can lead to fish consumption advisories. Considerable effort is being targeted on mercury, which can be transported over large areas through the atmosphere and where effective risk management will require a multimedia perspective and substantial interagency and stakeholder cooperation. Pollution prevention and more stringent regulatory controls will be advanced for major emission sources and for legacy pollutants found in sediments. Prototype studies on mercury-related fish consumption advisory concerns are in progress at lakes in Wisconsin and in Florida to define effective management approaches.

Fish advisories have also been issued for other long-lasting toxic pollutants, including polychlorinated biphenyls (PCBs), chlordane, dioxins, and DDT, even though their use was banned or drastically restricted many years ago. Many of these pollutants settle into the sediments where they can remain as a source of contamination well after the original source is controlled. Many of these chemicals are also known or suspected endocrine disruptors, which can cause reproductive or developmental problems of special concern for women and children. The CWAP will accelerate the development of strategies to address these concerns about persistent toxins and endocrine disruptors.

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Actions for Improved Beach and Recreational Health Risk Management

The CWAP has helped accelerate the implementation of EPA's *Action Plan for Beaches and Recreational Waters* (ORD and OW, EPA/600/R-98/079). There are three main action areas in this *Beach Action Plan*. First, EPA will continue to promote better recreational water programs and improved risk communication activities. An example risk communication tool is EPA's BEACH Watch website, located at *http:www.epa.gov/ost/beaches*. This website makes information available to the public and decision makers in a timely fashion.

To keep this database of beach and recreational closure information accurate, EPA will conduct a National Beach Health Survey annually to collect detailed local beach information as well as data on state and local monitoring efforts, applicable standards, water quality communication methods, the nature and extent of contamination problems, and any protection activities.

EPA will also develop a national inventory of digitized beach maps. These maps will be linked with locations of pollution sources through a geographic information system. They are expected to become an invaluable source of information to local organizations and the general public.

EPA will develop and support strong regional and local partnerships through the Environmental Monitoring for Public Access and Community Tracking Program (EMPACT). Current beach-specific EMPACT projects with EPA offices in New England, the Mid-Atlantic, the Southeast, the Great Lakes region, the South, the West, and the Gulf Coast region are investigating the use of better bacterial indicators, exploring improved monitoring methods, developing site-specific predictive tools, and making timely beach information available to the public.

The second objective of the *Beach Action Plan* is to improve the science that supports recreational water monitoring programs. The *Beach Action Plan*'s scientific research addresses three broad areas. Rapid analytical methods are needed that adequately distinguish between indicators of human versus animal pathogens and that cover indicators for a broader range of human disease organisms than do present techniques. Modeling tools are also needed to help predict conditions likely to increase exposure risks, supplement conventional monitoring in making management decisions to lift bathing area closures, and to help in the design of more sensitive and efficient monitoring approaches. Finally, studies are needed on the impacts from combined sewer overflows (CSOs).

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CSOs are widely believed to be a major contributor to bathing area problems. EPA will target research to quantify CSO exposure risks under different flow regimes (wet weather and dry weather) and will document pathogen movement and survival rates in intertidal water and beach substrates that are often the main areas of exposure for children and other sensitive population groups. EPA will coordinate its efforts with other federal agencies in addition to its extensive efforts with state and local environmental and public health departments.

John Theilgard, Lake Washington, WA

Low oxygen concentrations, high temperatures, and high acidity can devastate aquatic communities.

waste spills restricted recreational activities.

Aquatic Ecosystem Concerns

A primary goal for waters of the United States is that they support aquatic life. As defined in Chapter 1, this means that the waterbody provides for the protection and propagation of desirable fish, shellfish, and other aquatic organisms. This section describes how states articulate this goal in their water quality standards and how pollution impacts aquatic life.

The states use a variety of approaches for setting standards to protect aquatic life. All states adopt aquatic life as a designated use for all waters unless they performed a use attainability analysis and determined the use has not and cannot be attained. Some adopt very general use designations that simply state that all waters shall support aquatic life, while others adopt detailed designations that describe the characteristics of the aquatic community that each type of water shall support.

All states adopt numeric criteria that establish thresholds for specific chemicals. All states adopt narrative criteria that prohibit the presence of toxic pollutants in toxic amounts. Most state standards include narrative criteria stating that waters will support the propagation and growth of all aquatic life.

To strengthen their ability to protect the biological integrity of aquatic ecosystems, EPA encourages states to adopt designated uses or biological criteria that define the aquatic community structure and function for a specific waterbody or class of waterbodies. These can be descriptive characteristics or a numeric score based on multiple measures of community structure and function. Currently about half of the states have or are developing refined use designations or biological criteria.

The challenge for EPA is to summarize the states' individual assessments, which are based on substantially diverse standards. The basis for EPA's summary is the final assessment status reported by the states on how supportive their waters are of the aquatic life use goal. As illustrated in the earlier chapters, states report that one of the leading reasons for waters being judged as impaired is a water's inability to meet the aquatic life use goal.

Pollution Impacts

The Clean Water Act defines pollution as any human-induced change in the chemical, physical or biological integrity of the nation's waters. Pollution includes not just toxic chemicals, but other stressors as well. States reported that some of these other stressors are the leading causes of impairment to aquatic life. These stressors include habitat alterations such as flow modifications and excessive siltation, nutrient enrichment, and contamination of sediments with persistent chemicals. Following a description of how pollution affects aquatic life, the impacts of these three stressors are explored.

A fish kill is one of the most obvious effects of pollution on aquatic life. This phenomenon is normally attributed to exceptionally low dissolved oxygen levels, usually due to excessive nutrients in the water, or to the discharge of toxic contaminants to the water column. A more insidious and less easily observable impact of pollution on aquatic life is stress on the resident aquatic biota. An indicator of aquatic life use impairment may be keyed to an individual organism's health measured in terms of growths, lesions, eroded fins, or body burden of toxic chemicals and their byproducts.

The most common impact of pollution on aquatic life is the shift of a waterbody's naturally occurring and self-sustaining biological community. An example would be the shift of a cold water trout stream to a warm water carp-dominated stream. This may occur due to a variety of reasons, but the most common are an elevation of temperature, a lowering of available dissolved oxygen, and an increase in sedimentation due to land use practices within the watershed. These perturbations to habitat and water quality may lead to an undesirable change in the aquatic community. Frequently associated with changes in the biological community structure are changes in biodiversity, e.g., loss of taxa, gain in invasive species, increase in harmful algal blooms, and loss of key food web support species such as diatoms, seagrasses, and submerged aquatic macrophytes.

Habitat

Habitat is the place where an organism or community of organisms lives. It includes both living and nonliving elements. The immediate habitat or microhabitat for aquatic life includes the ambient water and its physical and chemical characteristics, including temperature, flow rate, and dissolved oxygen content. It also includes the substrate or bottom of the waterbody, which can be rocky, sandy, silty, grassy, etc.

The larger-scale habitat or macrohabitat includes the stream banks and the overall watershed within which the waterbody and the aquatic organisms reside. The macrohabitat plays an important role in protecting water quality and aquatic life. It can act as a buffer to the aquatic system and diminish the impact of human perturbation.

Changes in watershed habitat affect waterbody habitat. For example, changes in the amount and type of vegetation within the watershed and, in particular, alongside the waterbody frequently result in increased sediment loads, elevated temperature, and wide fluctuations in the volume and velocity of flow. These changes, in turn, alter the ambient water quality and the

Tess Darling, Grade 3, NC

EPA has currently issued guidance to the states on how to monitor the biological condition of waters: *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition* (EPA 841-B-99-002) and *Lake and Reservoir Bioassessment and Biocriteria: Technical Guidance Document* (EPA 841-B-98-007). Further guidance integrating the various monitoring methodologies into a comprehensive assessment of aquatic life use support is planned for Fiscal Year 2000.

EPA's nutrient team is developing a series of technical guidance documents on techniques used to develop nutrient criteria for use in state and tribal water quality standards. The following draft guidance documents are undergoing peer review. They are available on the Internet at: *http://www.epa.gov/ostwater/standards/guidance/index.html*.

Draft Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs, April 1999

Draft Nutrient Criteria Technical Guidance Manual: Rivers and Streams, September 1999

substrate in which aquatic organisms and communities reside and, ultimately, the biological integrity of the aquatic ecosystem.

When rain falls within a watershed that has lost its natural vegetative cover, the rain flows more rapidly over the land. This reduces the amount of water that will percolate through the soil into ground water. It increases the volume and velocity of water entering the waterbody. It increases dirt and sediment carried into the waterbody. If excessive amounts of sediment are deposited in the waterbody, they can smother rocky, gravel, and grassy substrates within the waterbody that are critical to the propagation of aquatic life. The increased volume and velocity of water can scour the sides and bottoms of waterbodies causing erosion and compounding sedimentation problems.

Also, if the watershed historically had many trees, loss of this habitat reduces the amount of tree canopy shading the waterbody. This can cause the ambient water temperature to rise. Changes in natural habitat can also affect nutrient cycling within the waterbody. Both of these changes can cause significant shifts in the types of species that are tolerant of this new habitat and dramatically change the biological integrity of a waterbody.

Stable habitat is critical to protection and propagation of balanced indigenous aquatic communities. Habitat evaluation is one tool used to assess the vulnerability of an aquatic ecosystem. This information helps target where limited ambient monitoring resources would be best spent. The limitation of this approach is that, although poor habitat is usually an indicator of impaired aquatic life, acceptable habitat quality does not mean that aquatic life is healthy. EPA has issued basic habitat assessment guidance in the stream and lake bioassessment protocols. Additional guidance is being developed for other waterbody types including estuaries and wetlands.

Nutrient Enrichment

Nutrients are essential building blocks for healthy aquatic communities. They are necessary for metabolism. Nitrogen and phosphorous are required in relatively large amounts by plant and animal cells. Insufficient amounts of these nutrients results in less than optimal growth of plants including algae and other aquatic vegetation. Adequate plant growth is essential to support all the other organisms in a healthy, diverse, and productive aquatic community. Excess nutrients, however, can have detrimental effects on water quality and aquatic life.

Excessive amounts of nutrients, especially nitrogen and phosphorus, result in excessive growth of algae and other aquatic vegetation and potentially harmful algal blooms. Nuisance levels of algae are associated with dissolved oxygen deficiency leading to fish kills and imbalances in predator/prey relationships, decreased water clarity, loss of natural submerged aquatic vegetation (an important fish, shellfish, and wildlife habitat and nursery), odors, loss of natural biodiversity, and changes in water chemistry, e.g., increased pH in many waterbodies.

Nitrogen and phosphorus are transported to receiving waters from stream networks, rain, overland runoff, ground water, drainage networks, and industrial and residential wastewater discharges. Sources of nitrogen and phosphorus include fertilizers, sewage treatment plants, septic systems, combined sewer overflows, sediment mobilization, runoff from animal feeding operations, atmospheric transport, and internal nutrient recycling from sediments to the water column.

Nutrient enrichment is not a new issue. State 305(b) reports consistently identify nutrients as a leading cause of water quality impairment. Traditional efforts at nutrient control have been only moderately successful.

In February of 1998, President Clinton and Vice President Gore released a comprehensive *Clean Water Action Plan*. A key part of the plan provides for expanded efforts to reduce nutrient overenrichment of waters. The *Action Plan* calls on EPA to accelerate the development of scientific information and guidance concerning the levels of nutrients that cause water quality problems in different types of waterbodies and different geographic regions of the country. It also calls on EPA to work with states and tribes to adopt criteria for nutrients as part of enforceable state water quality standards under the Clean Water Act.

EPA, the U.S. Department of Agriculture, and other partners are working to accomplish the nutrient goals of the Clean Water Action Plan. EPA published the *National Strategy for the Development of Regional Nutrient Criteria* in June of 1998. In addition to describing the approach for developing nutrient criteria, it identifies some of the other efforts of EPA and its partners to address nutrient enrichment of our nation's waters.

Sediment Contamination

Certain types of chemicals in water tend to settle and collect in sediment. For example, some chemicals such as petroleum products and chlorinated solvents do not mix with water (are hydrophobic). Some metals such as lead and mercury can settle out due to gravity or can be adsorbed onto sediment particles.

Chemicals in sediment often persist longer than those in water, in part because they tend to resist natural degradation and in part because conditions might not favor natural degradation. Bacteria degrade some chemicals in sediment, but many persist for years even after the original source has been eliminated. In the water column, these pollutants may be too dilute to measure. But because currents tend to deposit sediments in distinct depositional zones, sediment can accumulate pollutants at these locations to toxic levels.

When present at elevated concentrations in sediment, contaminants can be taken up by organisms that live in or on sediments and can bioaccumulate up the food chain (see text box on page 192). Contaminants can also be released from the sediment back into the water column. In both cases, excessive levels of chemicals in sediment might become hazardous to aquatic life and humans.

EPA has developed methodologies for assessing the risk of toxicity to benthic dwelling organisms from metals and nonionic organic compounds. These methodologies are based on an approach called "equilibrium partitioning" that accounts for site-specific bioavailability of chemicals and has undergone full scientific peer review from EPA's Science Advisory Board. These methodologies can be used by states assessing the potential impacts of contaminated sediment on aquatic life.

In 1998, EPA reported to Congress on contaminated sediment. This report identified areas in the continental United States where sediment may be contaminated at levels that may adversely affect aquatic life and human health. The report was prepared in response to the Water Resources Development Act of 1992. It was prepared in conjunction with the National Oceanic and Atmospheric Administration, the Army Corps of Engineers, and other federal, state, and local agencies. Data from 1980 to 1993 were used in preparing this report.

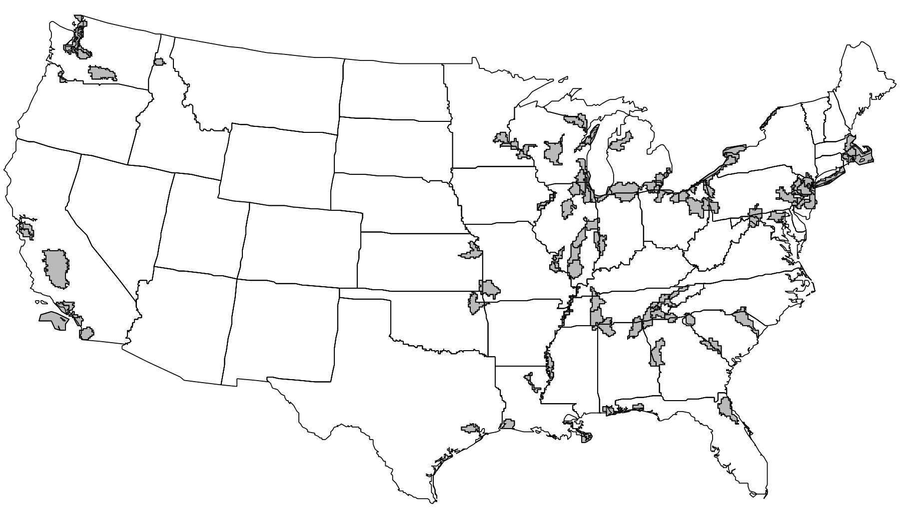
The report is based on existing data. It identified 96 watersheds that contain areas of probable concern—many of which are already well known to state and local government agencies and the general public (Figure 8-7).

According to this report, areas of sediment contamination occur in coastal and inland waterways, in clusters around larger municipal and industrial centers, and in regions affected by agricultural and urban runoff. The data and the evaluation results are intended to help local watershed managers identify local areas where additional analyses of water quality may be warranted.

EPA's Office of Science and Technology also developed the National Sediment Inventory (NSI), an extensive georeferenced database of sediment quality monitoring and pollutant source information for the nation's freshwater and estuarine ecosystems. Environmental managers can use NSI data and assessment protocols now as screening tools to help determine the incidence and severity of sediment contamination and to identify areas requiring closer inspection. In time, NSI data and assessments will

Figure 8-7

EPA's 1998 National Sediment Quality Survey Areas of Probable Concern



Other known areas of contaminated sediment (such as the Hudson River in New York and the James River in Virginia) are not depicted on this map but will be included in the year 2000 report to Congress.

From: *The Incidence and Severity of Sediment Contamination in Surface Waters of the United States* (3 volumes), available at *http://www.epa.gov/ost/cs/congress.html*.

reveal trends and help measure progress in minimizing risk.

For more information on EPA's contaminated sediment program, visit the program on the Internet at *http://www.epa.gov/OST/cs*.

In their 1998 305(b) reports, 11 states and tribes listed 115 separate sites with contaminated sediments and identified specific pollutants detected in sediments. These states most frequently listed metals (e.g., mercury, cadmium, and zinc), PCBs, pesticides, PAHs, and other priority organic toxic chemicals. These states also identified industrial and municipal discharges (past and present), landfills, resource extraction, and abandoned hazardous waste disposal sites as the primary sources of sediment contamination.

Appendix E, Table E-10, lists individual state data on sediment contamination for the 11 states reporting. Several states preferred not to list contaminated sites until EPA publishes national criteria for screening sediment data. Other states lack the analytical tools and resources to conduct extensive sediment sampling and analysis. Therefore, the limited information provided by states and tribes probably understates the extent of sediment contamination in the nation's surface waters.

EPA has developed guidance and information sources to provide states with better tools for assessing and managing sediment contamination. A list of sediment contamination materials is available on the Internet at *http://www.epa.gov/OST/pc/csn.html*. Information on equilibrium partitioning sediment guidelines (sediment quality criteria) can be found at *http://www.epa.gov/OST/pc/equilib.html*.

River of Words 1997 Finalist, Adam Hirsch, *Down by My Bay*, Grade 7, California

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The Mid-Atlantic Highlands Assessment Project

The Mid-Atlantic Highlands Assessment (MAHA) builds on a number of previous regional initiatives in the eastern United States including studies of acid rain effects under the National Acid Precipitation Assessment Project (NAPAP), the Environmental Monitoring and Assessment Program's (EMAP) Mid-Atlantic Integrated Assessment (MAIA), results from the trend analysis initiative known as the Temporally Integrated Monitoring of Ecosystems (TIME) project, and a previous Regional EMAP (R-EMAP) project coordinated by EPA Region 3.

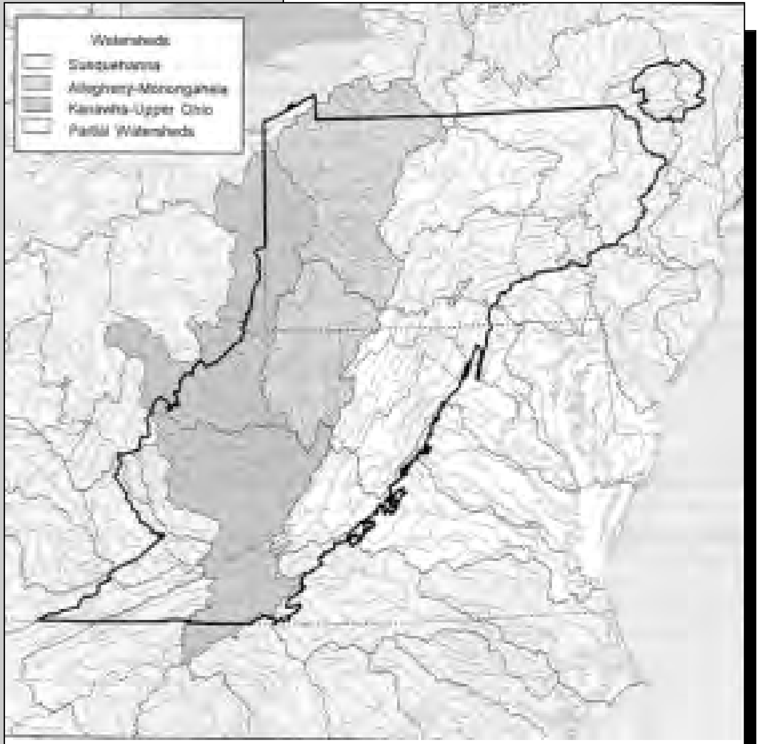

Figure 1. Three watersheds or combined drainage basins (water resources subregions) can be assessed in the Mid-Atlantic Highlands. The other watersheds extend outside the Highlands region. A watershed perspective is useful in viewing stream condition.

The geographic focus for MAHA is several large watershed areas on the upper Ohio River and Susquehanna basins extending to the west of the Blue Ridge and other mountain ranges that form the eastern Continental Divide. This 79,000-square-mile study area contains all of West Virginia, large parts of central and western Pennsylvania, portions of Maryland and Virginia, and areas outside EPA Region 3 in New York's Catskills. MAHA's scientific focus is on applying random site selection approaches to assess the ecological health of upland streams. Results can be presented according to administrative boundaries such as the states of West Virginia or Pennsylvania. Results can also be summarized for such major basins as the Susquehanna, the Allegheny-Monongahela, and the Kanawha-Upper

Ohio; or for such major terrestrial ecoregions as Western Appalachia, the Great Valley, North-Central and Central Appalachia, and the Ridge and Blue Ridge ecoregion (see Figures 1 and 2).

Pooling resources from state environmental agencies, EPA, and other federal natural resource agencies, multiyear data collections were undertaken on headwater streams rated as first to third order. These highland streams account for over 89% of the stream mileage in these basins, but most available monitoring work has tended to concentrate on larger streams and rivers and much of the data on these larger systems involves water chemistry measurements. For MAHA, conventional water chemistry measures were made for such major parameters as nutrients (nitrogen and phosphorus) and pH (acidity). The monitoring activities also developed a variety of biological assessments on fishes and various insect macroinvertebrates that spend their early life stages in the streams. For the fishes, tissue analyses were also performed to measure concentrations of such contaminants as mercury (see Figure 3).

The information on the fishes was worked up into a series of special metrics related to species diversity, the number of pollution-intolerant (usually native) species, the total number of fish species, and so forth. These separate metrics

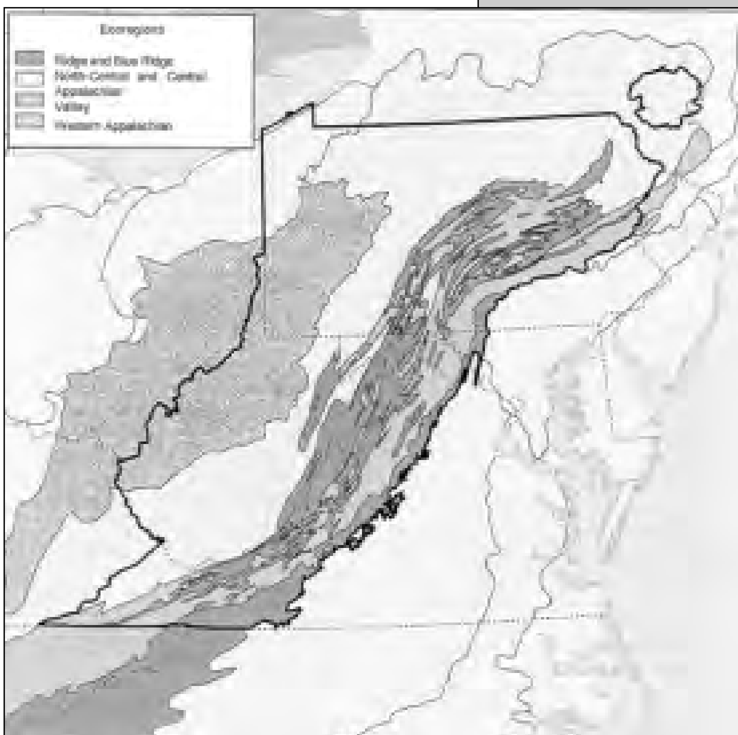

Figure 2. Ecoregions are areas with similar physical geography, soils, climate, and vegetation types. The Mid-Atlantic Highlands can be represented by four aggregated ecoregions. Ecoregions provide a useful perspective in viewing stream condition and characteristics.

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are then combined into a composite indicator called an **Index of Biotic Integrity** (Fish-IBI or IBI). For the insects, MAHA selected a macroinvertebrate index based on analysis of features of the three important taxa of the *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies), and *Trichoptera* (caddisflies) that are the main source of food for sports fish in most upland streams with hard substrates of gravels, pebbles, or rocks. An **EPT macroinvertebrate indicator** was determined based on the aquatic insect collections. Observations were also made of the condition of the stream substrate, banks, and the riparian areas close to the stream. Many of these standard biological and habitat monitoring techniques received a major boost from the initial release and ongoing updates to EPA's *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish* (available at *http://www.epa.gov/owow/monitoring/rbp*).

Monitoring sites were randomly selected to eliminate the possibility of taking samples from bridges or other easily accessed locations that often will not be representative of local stream conditions. Eliminating this sort of site selection bias makes it much easier to apply statistical tests to the assessment results. Margins of error and confidence limits can be estimated for the conclusions drawn from the MAHA project. For instance, for the FISH-IBI and EPT scores, typical margins of error were in the 10% to 12% range.

In addition to the chemical and biological sampling data, information was assembled on watershed conditions and general land use patterns for the current time period as well as available information going back several decades. Bioassessment indicators are usually compared against appropriate regional reference conditions to help define what indicator values can be classified as good, fair, or

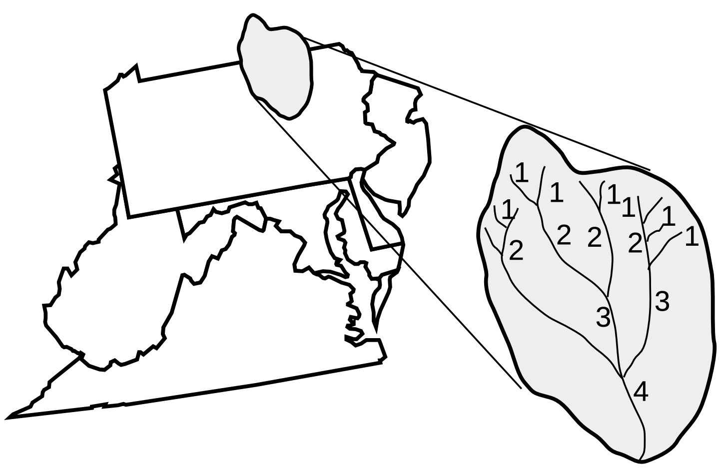

Figure 3. The majority of streams in the Mid-Atlantic Highlands (i.e., 89% or 72,200 stream miles) are classified as first- through third-order streams. This stream classification is illustrated above for one hypothetical watershed in the Highlands. The confluence (joining) of two first-order streams forms a second-order stream; the confluence of two second-order streams forms a third-order stream, etc.

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poor biological condition. For the current time period, these could be actual reference sites considered to reflect the best biological conditions currently attainable. From historical records and museum collections, MAHA also attempted to define reference conditions expected before large-scale European settlement of the area (that is, "precolonial" conditions).

The results of the MAHA biological indicators showed differences depending on the selection of the Fish-IBI or the EPT macroinvertebrate scores. Using reference sites reflecting best attainable current conditions, approximately 25% of the streams in the study area would be rated as showing good conditions, 50% fair, and 25% poor conditions. For the Fish-IBI, the results for the overall study area were 25% of the streams with good conditions, 33% fair, and 42% poor. For the Fish-IBI, shifting the reference sites to a hypothesized "precolonial" standard suggests only 10% of highland streams showing good conditions; 39%, fair; and 50%, poor (see table).

The substantial differences in the findings from the Fish-IBI and the EPT macroinvertebrate scores are the subject of ongoing investigations. Two factors that may account for the differences in performance in the two indicators are that some headwater streams either showed naturally very few different types of fishes or were essentially without fish.

MAHA also carried out preliminary analyses on major categories of pollution stressors. For eight different stressor or pollutant factors, the top four involved nonnative fish, excessive levels of nitrogen (a nutrient), and problems with either instream or riparian habitat conditions (see Figure 4).

The Mid-Atlantic Highlands Assessment project has helped states gain facility in applying bioassessment techniques in ways that encourage the analysis of the results for large landscape units such as basins or ecoregions. For waterbody

Comparison of Fish-IBI and EPT Macroinvertebrate Scores (percent)

	Good	Fair	Poor
EPT	25	50	25
Fish-IBI	25	33	42
Fish-IBI "precolonial"	10	39	50

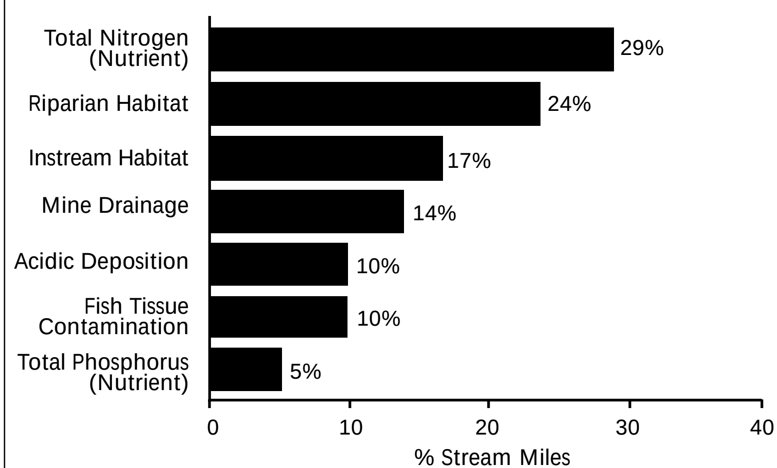

Figure 4. Overall ranking of potential stressors influencing the condition of Mid-Atlantic Highlands Streams.

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types such as small headwater streams that have traditionally not been adequately studied, random survey approaches show great promise as a way to develop a suitable baseline of information efficiently and in a fairly short span of time. While additional work is needed to clarify cause-effect relations between indicators of biological health and specific pollution factors, MAHA has considered several potential stressors and made preliminary estimates of the relative magnitudes of their impacts. In the future, regional analyses similar to MAHA will become important contributors to the Section 305(b) process and to other watershed-based management efforts by EPA and the states.

River of Words 1999 Finalist, Elaine Sullivan, Age 9, *A Frog Named Lily*, MA

Letter to the Architect

Not even you can keep me from
mentioning the fish, their beauty of
scaled brevity, their clipped-swishing
tails funneling in everything animal.
Wintertime when I saw them, their
pursed old ladies' mouths, gaping under
pooled clarity to share some gulled-up gossip.
Their bones, pure equilateral, poked stripes
at base and height, bereft of architects' errors
or human compensation. I remembered then
your last letter; you wrote you couldn't cut
another mitre, solder another joint, peel
another bit of glue from between your fingertips.
I'm going to crack soon, you said.
There must be some way to perfection
in this grasping for centimeters. The stick
will stay straight, the model be done,
done beautifully and done well someday.
I wrote back–I only know the cod with their
paling rib bones, their geometry unwarped by cold.
I know their tunnels dug frost-time underwater,
their crossings of snowflake symmetry. When
the thaws come, their finned bodies filter
the halfway ice like clean spectra.
You must know–the sight is exquisite.
If only I could give the gift of fish-making
in as many words as this.

River of Words 1998 Grand Prize Winner (Poetry, Grades 10-12)
Rebecca Givens, Grade 11, GA

Ken Gilland, Key Largo, FL

Costs and Benefits of Water Quality Protection

Introduction

Section 305(b) of the Clean Water Act calls for states to prepare estimates of the economic and social costs and benefits necessary to achieve the goals of the Act. The goals that states focus on are that all waters are fishable and swimmable. This means that water quality is good enough to support a balanced population of shellfish, fish, and wildlife and allow recreational activities in and on the water. Because states develop water quality standards to support these and other beneficial uses, they generally consider the costs and benefits of meeting water quality standards when they evaluate the costs and benefits of achieving the goals of the Act.

Unfortunately, this is a very daunting task. It may seem fairly easy to count the amount of money spent on pollution control by the public and private sector, but these data can be difficult to obtain.

Measuring benefits poses a more complex challenge. First, benefits are realized by a wide variety of users, ranging from commercial fishing operations to individuals who want to know that the environment passed on to their grandchildren will be healthy. Second, it is easier to describe benefits than it is to put a dollar value on them because many types of benefits do not involve market transactions. Many argue that it is not appropriate to try to put a dollar value on all of the benefits of a clean environment.

Ultimately, implementation of the CWA takes place at a very local level, and the costs and benefits of cleaner water are realized initially at the local level. For example, improvements in water resource quality usually result from investment of time and money to address a specific problem or combination of problems in a specific area. Therefore, changes in the quality of water resources, such as reductions in levels of pollutants or improvements in aquatic habitat, occur in fairly localized areas. These localized improvements in the quality of water resources result in changes in the structure and function of local aquatic communities, including populations of fish and wildlife. The ways in which people value water quality improvements reflect their beliefs and priorities. Consequently, implementation costs, the resulting changes in the condition of the waters, and the resulting benefits are best generated beginning at the watershed level and aggregating up to the state and national level.

Unfortunately, neither the data nor analytic tools and expertise are available to comprehensively build and estimate the costs and benefits of achieving the goals of the Act from the watershed up to the nation. Efforts to estimate the economic and social costs of achieving the goals of the Act are hindered by a number of factors. The primary factors are:

- Limitations of analytic tools to characterize costs and benefits
- Insufficient data on water quality conditions and trends and links to benefits
- Insufficient data on resource needs to fully meet the goals of the Act.

The inadequacy of environmental data leads, in turn, to enormous difficulties in estimating the nationwide economic and social effects of attaining the CWA's goals. The lack of watershed-level data on waterbody conditions and trends makes the estimation of the resulting economic and social effects at the local level extremely difficult as well as incomplete.

To provide some sense of an overall national picture of past and future effects of the CWA, absent the information needed to build the picture from the bottom up, EPA has drawn upon the very limited number of national reports and databases relevant to this topic. Sources of such information include the U.S. Department of Commerce, Bureau of Census, the Sport Fishing Institute, state reports, EPA, and other federal sources. Though unable to form the basis for a precise estimate of nationwide effects of the CWA, these studies do provide a useful framework that gives some sense of the magnitude of these impacts. Some of these studies express data in terms of economic measures, while others use different quantitative measures from fields such as sociology and political science. Still other relevant reports express information in qualitative terms, including national public opinion surveys. The first part of this chapter presents this overview information.

The nationwide picture presented in this chapter is supplemented by another section that contains information based on data in the 1998 305(b) reports submitted by the District of Columbia, Puerto Rico, and the following states: Arizona, Hawaii, Illinois, Indiana, Louisiana, Maryland, Massachusetts, Michigan, New Hampshire, North Dakota, Oregon, Rhode Island, South Dakota, Utah, Vermont, Virginia, and Wyoming. Because they are easier to calculate, estimates of the economic costs of selected activities to improve water quality are more common in these reports. Estimates of the economic and social benefits resulting from improved water quality are more difficult to quantify. Hence, state reports, and this national report from EPA, also include qualitative descriptions of benefits and quantitative results from small-scale studies of the benefits of water quality restoration. The second part of this chapter presents this state-by-state information.

Costs and Benefits of Water Quality Improvement

Costs of Water Quality Improvement

Estimates for the most current available year (1994) of the costs of implementing water quality control programs called for in the Clean Water Act are shown in Table 9-1. This information was derived from President Clinton's *Clean Water Act Initiative: Analysis of Costs and Benefits*. This table shows expenditures associated with the implementation of the Clean Water Act requirements. It includes implementation of all aspects of the cycle for water-quality-based pollution control:

- Development of water quality standards
- Assessment of water quality
- Characterization of causes and sources of impairment
- Development of point and non-point source loading allocations to achieve the water quality standard
- Implementation of source controls
- Evaluation of the effectiveness of controls
- Followup actions and reiteration of the cycle to ensure all waters meet water quality standards.

According to this report, private sources spend roughly $30 billion per year on water pollution control.

Table 9-1. Summary of 1994 Current and Planned Spending under the Existing CWA ($ million/year)[a]

Description	Private Sources	Municipalities	Agriculture	State Water Programs	Federal Agencies	Total (Quantified)
Pre-1987 CWA base programs WQS TMDL Monitoring NPDES	$25,286	$17,190	$191	$373	$9,564	$52,604
Post-1987 CWA additional programs NPS Controls/ Watershed		$389 - $591	$240 - $389	$125	$234	$988 - $1,339
Storm Water: Phase I	$3,990	$1,650 - $2,555				$5,640 - $6,545
CSOs		$3,450				$3,450
Other Costs	$943 - $1,073	$88				$1,031 - $1,161
Total	$30,219 - $30,349	$22,767 - $23,874	$431 - $580	$498	$9,798	$63,713 - $65,099

[a] The values shown here are only for administering the plan.

Source: U.S. EPA. 1994. *President Clinton's Clean Water Act Initiative: Analysis of Costs and Benefits*. EPA 800-S-94-001. Office of Water, Washington, DC.

In addition, municipalities spend $23 billion per year and agriculture approximately $500 million per year. Federal agencies dedicate an estimated $10 billion and state water programs $500 million to water resource protection each year. In total, there is an estimated expenditure of $63 billion to $65 billion per year to protect and restore water quality nationwide.

Benefits of Water Quality Improvement

Improvements in the physical, chemical, and biological quality of our nation's waters are valuable to all Americans. The benefits of achieving the objectives of the Clean Water Act are, and will be, manifest in a variety of ways including

- Increased recreational choices
- New and expanded business opportunities
- Improved property values
- Expanded educational and research options
- Greater peace of mind regarding the condition of the natural heritage we pass on to future generations.

Activities such as fishing, swimming, and boating on waters would not be adequately safe or sufficiently satisfying without the control measures undertaken under the Clean Water Act. Cleaner water lowers treatment costs to agriculture and to industries by avoiding pretreatment costs before usage of these waters. It also reduces costs to drinking water systems that might otherwise have to install additional treatment technologies. Cleaner waters also provide important aesthetic benefits to Americans.

Although it is relatively easy to list the various categories of health, social, psychological, and economic benefits to current and future generations, it is extremely difficult to estimate the magnitude of such benefits. Still, there are a number of sources of data that provide some indication of the scale of such benefits. The following section presents a sampling of such information.

Recreation

Water-based recreational activity makes a large contribution to America's economy. A 1994 Roper Survey found that beaches, rivers, and lakes are Americans' top vacation choices, followed by national and state parks, many of which are centered on natural water features. Overall, Americans take over 1.8 billion trips to engage in one or more forms of water-based recreation. Given that the recreation and tourism industry in the United States enjoys sales of over $400 billion annually, economic activity associated with highly popular water-based recreation is clearly quite large.

According to the 1994 National Survey on Recreation and the Environment (NSRE), sponsored by the U.S. Forest Service, National Oceanic and Atmospheric Administration, and other agencies and organizations, 125 million Americans over age 15 visited a beach or waterside area—62% of those in this age group. An estimated 78 million swam in a river, lake, or ocean—an increase of 38% since 1982. Water-based nature study was enjoyed by 55 million Americans, representing 28% of the population over age 15. Remarkably, 27 million people participated in some form of viewing fish and other aquatic life.

All this recreational activity generates, of course, a tremendous amount of economic activity. For example, anglers spent $15 billion in 1996 for fishing trips, $19 billion on equipment, and $3.2 billion for licenses, permits, and other miscellaneous expenses, according to the 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation conducted by the U.S. Fish and Wildlife Service (FWS). Expenditures for equipment related to wildlife watching, much of which is focused upon aquatic and riparian species, increased by 21% since 1991. According to this study, the total impact of fishing-, hunting-, and wildlife-associated recreation in 1996 was $101 billion. Though not all of this can be attributed directly to healthy waterbodies, all species of animals and plants depend upon adequate supplies of clean water.

There are indications that a significant portion of the public thinks that their enjoyment of water-based recreation is restricted by poor water quality. For example, the 1994 NSRE found that 10% to 20% of various sectors of the public felt that pollution problems constrained their outdoor recreation activities. Actions taken to restore impaired waters and protect the integrity of currently healthy waters should lead to a smaller proportion of these sectors of the public feeling that their outdoor recreational experience has been compromised, thereby increasing total overall benefits to the nation.

The 1997 FWS Survey also found that 20% to 25% of persons characterized as "nature lovers," hunters, and fishers felt the quality of their outdoor recreation experience was constrained by "crowded activity areas." It is likely that, as more waterbodies are restored to healthy conditions, recreational use will be less concentrated on those waterbodies that are currently healthy. This will result in less crowding, on average, thereby providing benefits in the form of improved quality of recreational experience to a sizable fraction of the total population.

Commercial Fishing

The National Marine Fisheries Service report on U.S. coastal and offshore fisheries reported that the value of U.S. commercial fish landings was about $3.1 billion in 1998. Shellfish landings represented slightly more than half of this total. Over 80% of the value of U.S. finfish landings was from species that are dependent on near-coastal waters for breeding and spawning. At the time of the 1998 report, the U.S. commercial fishing fleet included nearly 75,000 vessels. Almost 5,000

Melissa Malkin, Carolina Beach, NC

processing and wholesale plants employed over 83,000 people in 1997.

Yet, the contribution of the commercial fishing sector to the overall economy potentially could be increased if, through cleanup of key coastal waters, thousands and thousands of acres of shellfish beds that are currently closed or restricted due to pollution could be reopened to commerce.

Other Water Quality Benefits to the Economy

Other highly important sectors of the American economy are dependent upon supplies of good-quality water. In 1995, the USGS estimated that manufacturing companies used more than 9 trillion gallons of fresh water each year. According to the 1997 Census of Agriculture, the agricultural sector, which produced $197 billion worth of products in 1997, is increasingly dependent on irrigation of crops, drawing upon both surface and ground water supplies. The $100 billion/year soft drink and beer industries are highly dependent on supplies of high-quality water.

Good water quality is important for local economic development. Companies that want to attract the best workers often locate in areas noted for parks and open spaces, where air and water quality are good and recreational opportunities are abundant. These amenities are essential for the quality of life required by today's workforce.

The Institute for Southern Studies published a study in October 1994 illustrating the relationship between state economic growth and environmental quality. This study shows that strong environmental standards and gross state products growth are positively related, although the causal relationships underlying this association have not been established. For example, the study ranked Louisiana last for jobs and environmental quality. Eight other southern states (along with Indiana, Ohio, and Oklahoma) ranked among the 14 worst states in both categories. Hawaii, Vermont, and New Hampshire ranked among the top six states for both jobs and environmental quality. Six states ranked among the top 12 in both categories: Wisconsin, Minnesota, Colorado, Oregon, Massachusetts, and Maryland.

Ecological Benefits

Restoration of impaired waters and protection of threatened waters promises to result in significant ecological benefits. Currently, a disproportionate number of aquatic and semi-aquatic species of plants and animals are endangered or threatened. According to the Nature Conservancy's document *Rivers of Life* (1998), two-thirds of the nation's species of freshwater mussels are at risk of extinction, half of all crayfish species are in jeopardy, and 40% of the species of freshwater fish and amphibians are at risk. Some of the causes of declines in populations of these species are activities, such as overharvesting, that are unlikely to be affected by implementation of the Clean Water Act. But other factors contributing to the declining condition of a number of these species are addressed by the Act. For example, pollution is listed as a contributing factor in the decline of 30% to 90% of the species in each of four categories of water-dependent species—fish, crayfish, amphibians, and freshwater mussels.

The Nature Conservancy concluded that "protecting and restoring 327 watersheds—15% of the total (nationwide)—would conserve populations of all at-risk freshwater fish and mussel species in the United States." This suggests that a wisely targeted strategy for implementation of the CWA for both impaired and threatened waters could significantly contribute to the protection and recovery of aquatic biodiversity in the United States.

Not only is protection and restoration of the ecological integrity of our nation's waters deemed highly important by the scientific community, polling data indicate that protection and restoration of biodiversity enjoys strong public support. A 1996 national poll conducted by Beldon and Russonello got the following responses from a series of questions designed to understand how environmental protection fits into the priorities of U.S. citizens.

■ Compared to dealing with other issues you are concerned about, how important is maintaining biological diversity (preventing the extinction of plants and animals)?

Very important	41%
Somewhat important	46%

■ Protecting jobs right now is more important than saving habitat for plants and animals.

Strongly disagree	19%
Somewhat disagree	45%

Even when asked about paying more in federal taxes to have the government buy land to protect endangered species and habitat, 48% agreed, and 78% supported tax incentives to encourage land owners to voluntarily protect habitats for plants and animals.

Other Indicators of the Public's Perception of Benefits from Cleaner Water

Results of other public opinion surveys indicate that a large portion of the American public believes that there are problems with the condition of our nation's waters. A number of national polls have shown that Americans view water pollution as one of the top two or three environmental problems in the United States. For example, the 1993 Roper poll conducted for the National Geographic Society found that 75% of Americans felt that water pollution is among the most serious environmental problems facing future generations. This same poll found that 39% say that the quality of the fresh surface waters in their community (used for recreation, wildlife, and industry) was only "fair" or "poor."

A 1997 poll conducted by Roper for the National Environmental Education and Training Foundation (NEETF) found that 72% of the public believed that "environmental protection laws and regulations dealing with water pollution have not gone far enough." This contrasts with 62% of the public who felt this way about air pollution and 48% who said this about protecting wild and natural areas. Only 4% of those polled indicated they thought laws and regulations dealing with water pollution had gone too far, compared with 6% for air pollution and 7% for protecting wild or natural areas. A 1996 poll conducted by Belden and Russonello found that 64% of Americans strongly agreed with the statement, "[Clean Water Act] regulations should be maintained because water quality is worth the cost, and the regulations have had positive effects on water quality." Conversely, only 7% strongly agreed with "We need to reduce the hundreds of regulations in the Clean Water Act because they have become too restrictive and expensive for business and private citizens." (These findings were consistent across all key demographic groups, based on gender, races, ages, and income and educational levels.)

Regardless of whether the opinions reflected in these poll findings are based on an accurate understanding of the condition of the nation's waters and the nature of the rules designed to protect them, these polling data do indicate that any actual improvement in water quality is likely to be perceived as beneficial by a large portion of the populace.

The 1996 Beldon and Russonello poll provides some insight into the personal values that underlie support for protection of the environment. Eighty percent (80%) of those polled cited "wanting your family to live in a healthy pleasant environment" as a reason for personally caring about the environment. Seventy one percent (71%) said "responsibility to leave the earth in good shape for future generations" was a primary reason for environmental concern. "Nature is God's creation and humans should respect God's work" was chosen by 67% of those polled.

The 1997 Roper poll for NEETF also found that people's concerns about the environment were not significantly tempered when placed in contrast with economic considerations. Fully 69% of those polled replied "environmental protection" when asked, "When it is impossible to find a reasonable compromise between economic development and environmental protection, which do you usually believe is more important: economic development or environmental protection?" A 1993 Roper poll found that 76% of the people felt that upgrading municipal water treatment systems was a good or excellent idea, even if it resulted in raised local taxes. Though one can question whether these answers accurately reflect what people would actually do when confronted with such a choice, the answers do suggest that the public puts a high value on protection of the environment and is willing to pay for such protection.

Another indicator of public concern for protection and restoration of water resources is the rapidly growing number of people involved in organized efforts on behalf of streams, lakes, marshes, bays, estuaries, and coastal waters. For example, the Adopt-Your-Watershed database currently has over 4,000 local groups that are involved in one or more types of waterbody protection and restoration efforts. In these examples, people are contributing their time and energy, perhaps as well as some of their money.

Water Quality Costs and Benefits Identified by the States

Most states reported that they encountered great difficulty in reporting on the economic and social costs and benefits of actions to achieve the goals of the Act. Most states were able to provide some estimates of expenditures on some aspects of water quality protection or restoration. Typically, this cost information included the amount of money provided through grants or loans to upgrade municipal wastewater treatment plants or the annual budget for the jurisdiction's water quality management program.

When reporting on benefits, most of the states provided limited qualitative descriptions of the types of benefits accompanying implementation of the Clean Water Act. Several states, however, conducted cost/benefit analyses. For example, Illinois reported on a cost/benefit analysis performed for three lake restoration projects. The District of Columbia reported on the number of fishing licenses issued as an indicator of the benefits of improved water quality.

The following section highlights some of the more recent data reported by states, the District of Columbia, and Puerto Rico in their Section 305(b) water quality reports.

District of Columbia

The District of Columbia reported on the total operating costs of treating wastewater at the Blue Plains treatment plant. This is one of the largest wastewater treatment plants in the country. The plant's service area includes the District of Columbia and parts of Maryland and Virginia. Increases in costs have come mainly from aging equipment and inflation's effect on wages, equipment, and maintenance costs. The total annual operating costs in 1998 were approximately $92.2 million. About $20 million of the 1998 costs were due to the upgrade and operation of the biological nutrient removal process. Annual costs in 1999 are estimated at $86.5 million.

The District offered a discussion of the qualitative improvements in water quality over the past decade. Recreational fishing is one area that has benefited from such improvements. Routine surveys conducted by the Fisheries Management Branch reveal a significant increase in the number of game fish, including striped bass and perch. The sale of fishing licenses in the District is also an indicator of recreational use. In 1988, the District of Columbia began to require that anglers purchase a license to fish in District waters. The number of licenses sold from 1988 to 1995 increased from 4,900 to 12,695. However, in 1996 and 1997 the number of licenses sold decreased slightly to 11,028 and 10,925, respectively.

Arizona

The population of Arizona has been increasing rapidly. In 1950, the state's population was 775,000. By 1995, the population increased to an estimated 4.2 million. Most of this increase occurred in the two largest cities, Tucson and Phoenix.

This rate of population growth will require the creation of additional sources of water to cover the demand for agricultural, municipal, and industrial use. At present, 60% of the public drinking water supply in Arizona is ground water. State planners anticipate that the use of effluent and surface water sources will need to increase to satisfy the increasing demand for water. The goal is to provide inexpensive, high-quality water supply to serve a variety of users. For this to happen, the state needs to increase its efforts in protecting and remediating both surface and ground water sources.

Arizona designates all ground water aquifers for drinking water use. The goal of the Aquifer Protection Permit Program is to prevent pollution of Arizona's ground water by controlling discharges from wastewater treatment facilities, industrial sources, and mining operations. In 1997, the program spent over $2 million and targeted nitrogen reduction in discharges that impact ground water supplies. Nitrogen poses a serious health risk in drinking water, particularly to infants. Arizona's program resulted in the removal of 12,179 tons of nitrogen in 1997.

The annual expenditures of the state's water quality programs provide an estimate of the costs to maintain water quality programs during the years 1994 through 1997. Table 9-2 shows this information.

Table 9-2. Arizona's Water Pollution Control Costs

Program Name	FY 1994	FY 1995	FY 1996	FY 1997
Water Quality Program Management	$1,615,300	$1,463,800	$2,194,500	$1,805,500
Safe Drinking Water	$1,489,800	$1,704,800	$1,780,200	$1,789,800
Water Quality Assessment and Monitoring	$2,177,200	$7,031,700	$1,728,600	$1,943,500
Point Source Discharge	$3,128,400	$2,877,800	$2,670,000	$2,312,100
Nonpoint Source Discharge	$1,344,000	$1,770,700	$1,801,800	$1,386,800
Public Health Safety		$104,400		
Underground Storage Tanks Program	$16,778,700	$23,836,200	$36,088,700	$32,187,900
Superfund Program	$2,102,200	$3,395,500	$4,142,600	$3,566,700
Total Water Pollution Control Programs	$28,635,600	$42,185,000	$50,415,200	$44,992,300

Hawaii

Hawaii's 305(b) report estimated that, since 1995, Honolulu County has spent $279 million on wastewater and public works projects; Maui County has spent $82 million on sewer operations, flood control, and drainage; and Kauai County has spent $7 million on stormwater control and sewage treatment. Although the state's report did not provide detailed information on monetized benefits, the state noted that water quality improvements increase the economic well-being of the population. Benefits include improved recreational opportunities, aesthetics, and commercial fishing opportunities.

Illinois

Illinois' 305(b) report stresses the fact that collecting information on costs and benefits related to the achievement of the objectives of the Clean Water Act was a complex task, and the tools and information needed are not readily available.

The state reported the individual program costs of pollution control activities in the state of Illinois for the year 1996 (Table 9-3). In addition to these costs, the Bureau of Water distributed a total of $18.2 million in state construction grants and an additional $66.6 million in loans for the construction of municipal wastewater treatment facilities.

The Illinois Bureau of Water prepared a cost/benefit analysis of efforts to restore water quality in three inland lakes. By comparing pre- and post-restoration water quality conditions in the lakes, annual benefits were calculated based on potential increases in "visitor days" estimates. The results are shown in Table 9-4.

Indiana

Since July 1, 1997, more than 30 communities in Indiana have obtained loans of over $174 million for water quality improvements through the State Revolving Loan Fund (SRF) Program. One of these

Table 9-3. Program Costs for Illinois Environmental Protection Agency's Bureau of Water

Activity	Total
Monitoring	$3,928,700
Permitting	$2,785,800
Planning	$1,292,600
Compliance/Enforcement	$3,596,600
Facilities Administration	$2,039,700
Lake Protection and Restoration	$754,100
Nonpoint Source Control	$2,610,200
Ground Water Protection	$1,804,500
Total	$18,812,200

Table 9-4. Summary of Cost/Benefit Analysis for Lakes Restoration Projects in Illinois

Lake Name	County	Increase in Annual Benefits Post-Implementation	Total Discounted Benefit 10 Years @ 7-1/8%	Restoration Activities	Benefits to Costs (in dollars earned to dollars spent)
Le-Aqua-Na	Stephenson	$660,700	$4,614,000	$262,918	17.5:1
Johnson Sauk Trail Lake	Henry	$487,630	$3,405,500	$131,000	26.0:1
Lake of Woods	Champaign	$197,060	$1,376,000	$256,434	5.4:1

loans included a $2 million drinking water project.

Indiana's 305(b) report notes that improvements in water quality result in better recreational opportunities, more aquatic diversity, healthier sport fish populations, safer drinking water, increased use of beaches, and healthier aquatic ecosystems. The Office of Water Management in Indiana did not quantify these benefits. However, through the Performance Partnership Agreement with EPA they expect to have the necessary resources to quantify the significant benefits of water pollution abatement.

Louisiana

Louisiana spent approximately $8.5 million in FY 1995 and $13.4 million in FY 1996 to protect the state's water resources. While much of this budget was self-generated through permit fees and enforcement actions, a portion was derived through federal grants.

Louisiana's 305(b) report estimates that, from 1992 to 1994, the state's economy benefited from water quality improvements of approximately $1.6 billion. These benefits are associated with commercial and recreational fishing ($1 billion) and hunting and nonconsumptive uses ($656 million). Although hunting and nonconsumptive wildlife activities are not directly associated with water quality, terrestrial wildlife and especially waterfowl are dependent on the availability of high-quality waters. In addition to these direct monetary benefits, visitors to Louisiana have an additional impact on many local economies. Although all outdoor recreation may not be water-based, it can be assumed that water quality is a factor in the overall environmental perception of travelers.

Michigan

Since 1972, Michigan has spent about $4 billion on about 1,100 municipal wastewater treatment plant improvement projects. The state estimates that $900 million is needed to meet federal and state requirements for municipal wastewater treatment and an additional $1.9 billion is needed to meet optimal conditions that reflect water quality enhancement, growth capacity, and economic development. In addition, the state estimates costs of $1.0 billion and $2.6 billion for combined sewer overflow initiatives in the Rouge and Detroit river basin communities, respectively.

Michigan is currently investigating the possibility of using market-based pollutant trading concepts to optimize overall water quality while minimizing costs. Through the implementation of effluent trading, the state expects to improve water quality, minimize costs, form partnerships, and provide greater flexibility in attaining water quality objectives.

New Hampshire

The cost information New Hampshire presented in its 305(b) report is mostly gathered from ongoing public pollution control projects that have received state and/or federal financial assistance. The state estimates total spending for wastewater treatment works through the Federal Construction Grants program of $838 million (Figure 9-1). Through the State Revolving Fund program, New

Hampshire was able to provide loans to municipalities totaling over $153 million from FY 1989 through FY 1997. In addition, the Governor of New Hampshire and supporting Legislature enacted Chapter 277 of the Laws of 1992 to provide a new 20% to 30% state grant program for local water pollution control projects. This law directs the state Department of Environmental Services to maintain a priority list of projects eligible to receive these funds. The current priority list includes 99 projects with a total cost of over $96 million for FY 1998 and 23 projects with a total cost of nearly $29 million in FY 1999.

New Hampshire noted that all types of water pollution abatement projects benefit the quality of the state's water by reducing the loading of pollutants into the surface waters. However, the state had difficulties in trying to quantify the social and economic benefits of these projects.

North Dakota

The costs associated with municipal point source pollution control programs in North Dakota have been quite significant. Most of these expenditures have been in the area of capital investments. In 1996 and 1997, approximately $42.9 million from the State Revolving Fund was used for the construction of wastewater system improvements. In addition to SRF funding, several communities have upgraded their wastewater treatment facilities at their own expense.

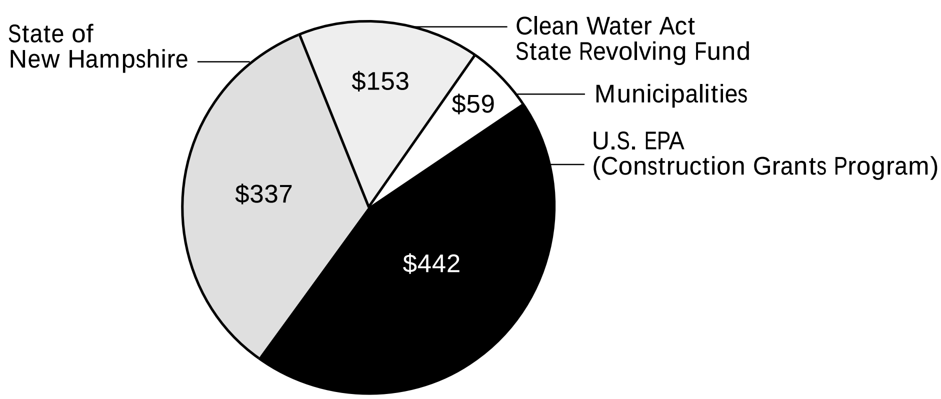
North Dakota did not quantify monetary benefits of water quality expenditures in their 305(b) report. The state notes that qualitative benefits include the elimination and reduction of waste loads to receiving waters and the reduction of stressors to public health, such as malfunctioning drainfield systems and sewer backups.

Oregon

A 1997 report provides estimates of the costs and benefits of water quality improvements in Oregon's Willamette Valley. At one time, the Willamette River was one of the most polluted waterways in Oregon, but since the 1960s this basin has experienced significant water quality improvements. Most of the pollution was coming from municipal and industrial dischargers, although nonpoint sources also played an important role. The report estimated that between $215 million and $282 million (1995 dollars) have been spent annually on water pollution control costs in the basin since the 1960s.

Figure 9-1

Costs Incurred in Wastewater Treatment Works in New Hampshire ($ millions) 1972 – 1997



Total = $991 million

The qualitative benefits of water improvements in the Willamette Basin include increased participation in water-related recreational activities, improved services and aesthetic values, and reductions in water treatment costs and human health risks, among others. The quantifiable benefits range from $146 million to $318 million. The state reports that a cost-benefit analysis would be difficult to perform at this point since not all the benefits have been quantified. However, the report suggests that, overall, the annual benefits of improved water quality in the Willamette Valley may exceed water pollution abatement costs.

Puerto Rico

The Puerto Rico Environmental Quality Board is in charge of management of water pollution control activities, which is carried out using a combination of federal and state funds. Table 9-5 summarizes Puerto Rico's estimated costs to improve water quality.

Table 9-5. Summary of Costs Dedicated to Improvement of Water Quality in Puerto Rico ($ thousands)

Destination	Year	Amount	Source
Water Pollution Control	1996	$2,242	Federal
		$1,733	State
	1997	$2,395	Federal
		$2,255	State
47 Municipal Treatment Works	1989 to 1995	$129,364	Federal
		$25,873	State
10 Municipal Treatment Works	1996 to 1997	$24,425	Federal
		$6,885	State
Construction Grants	1997 to 2001	$3,766,349	SRF Program

Rhode Island

Rhode Island's 305(b) report indicates that the state has spent or allocated an estimated $351 million from 1972 to 1977 in the improvement of the quality of its waters. Most of these funds came from EPA through federal Construction Grants Program funds. The money was allocated among the following projects:

- Six projects involved the construction of new treatment facilities and sewer systems
- Three projects included new wastewater treatment facilities (WWTFs) and installation of sewers
- Seven projects were directed to upgrading an existing primary facility to a secondary treatment plant, as required by the Clean Water Act
- Five projects involved specifically sewering areas not previously sewered and discharging to an existing WWTF
- Five projects dedicated to upgrading existing secondary WWTFs to larger, more modern facilities.

Rhode Island notes that the environmental and economic benefits derived from the investment in these projects are significant. The state reports an improvement of the water quality in the shellfish growing areas and in the finfishing industries, which combined are a $25 million industry. These activities also support the $2 billion a year tourism industry.

South Dakota

The state of South Dakota has placed a high priority on getting all state wastewater treatment facilities into compliance as soon as possible. The state has several "minor" facilities in need of upgrading. Many of the small communities served by these "minor" facilities are agriculturally oriented and financially strapped. The state works along with the communities to leverage additional grant funds. To improve the quality of the state's waters, the state has secured approximately $2.5 million per year from its Consolidated Water Facility Construction Program (CWFCP).

Utah

Since 1972, approximately 190 wastewater projects have been funded in Utah, with funding received from either EPA Construction Grants, the Utah Water Quality Project Assistance Program (WQPAP), State Revolving Funds (SRF), or the Utah Hardship Grant Program. Table 9-6 lists the assistance that was given for five time frames. The majority of the state's projects have been for the planning, design, and construction of wastewater collection and treatment facilities in communities.

The construction of centralized wastewater collection and treatment facilities provides water quality protection for surface and ground waters. Currently in Utah, very few large communities remain on septic tank/drainfield systems. Besides these direct benefits of investing in cleaner waters, the state's report mentions:

- Better public education and awareness about the need for water quality and environmental protection
- Pollution prevention of water quality degradation
- Better protection of fisheries in discharge receiving streams
- State legislators' awareness on the need of funding these projects
- Protection of human health

Table 9-6. Funding Expenditures and Project Costs for Wastewater Projects in Utah ($ thousands)

Time Period	EPA Construction Grants	WQPAP			SRF		
		Project Costs	WQPAP Assistance	Assistance Received (%)	Project Costs	SRF Assistance	Assistance Received (%)
1993 to 1995	$838	$21,308	$11,373	53	$73,990	$49,982	68
1985 to 1995	$14,662	$133,777	$36,653	27	$120,942	$83,909	69
1972 to 1995	$207,081	$165,198	$47,122	29	$120,942	$83,909	69
1996 to 1998	$0	$55,791	$6,107	11	$54,075	$29,916	55
1972 to 1998	$207,081	$220,989	$53,229	24	$175,016	$113,825	65

- Optimal reuse of biosolids resulting from wastewater treatment
- Community participation in oversight of wastewater treatment facility operations.

Vermont

Vermont spent approximately $468 million of state, federal, and local funds through 1997 to construct municipal wastewater treatment facilities and industrial wastewater treatment systems. Approximately $69 million per year is spent on the operation and maintenance of treatment plants in the state. Costs of assisting planning and implementation of nonpoint source pollution reductions total approximately $460,000.

Improved water quality in Vermont has meant less weed and algae growth, which resulted in improved aesthetics and enhanced swimming, fishing, and boating uses. The state assumes that human health is improved due to the removal of pathogens from water. Approximately 58 rivers and 3 lakes have benefited from these improvements. Vermont's report also mentions significant improvements in the Upper White River, where 4,525 feet of shoreline were stabilized and enhanced. Improvements were also noted from the denial of hydroelectric facility certifications in five cases. As a result of these habitat improvements, a total of 22.5 miles of Vermont rivers and approximately 3,600 acres of lakes have been improved significantly.

Virginia

Since 1988, Virginia has administrated a State Revolving Loan Program, offering loans to local governments at or below current market interest rates for wastewater treatment improvements. Between FY 1988 and FY 1997, Virginia has received federal capitalization grants totaling $358 million and has provided $72 million to the program.

In the state's 305(b) report, the following benefits are attributed to Virginia's loan program expenditures:

- Eliminated 12 wastewater treatment plants that provided only primary treatment
- Replaced/upgraded 25 inadequate lagoons
- Upgraded/expanded/replaced 80 outdated treatment facilities
- Improved water quality at 38 locations by reducing infiltration and inflow

- Corrected 21 potential health hazard situations due to the elimination of septic systems, pit privies, and straight-line discharges
- Eliminated 96 raw sewage overflow points.

Wyoming

Table 9-7 summarizes funds dedicated to water quality improvements in Wyoming. The state's 305(b) report notes that water suppliers in Wyoming are generally small and face more challenges as a result of complying with mandated water system improvements. This results in extremely high costs for drinking water in rural areas.

Although Wyoming could not quantify the value of water used for agricultural purposes, the state provided an estimate of the amount of land and livestock supported by water resources. In 1998, Wyoming's water resources were used to rear 1,530,000 cattle and calves and 680,000 sheep and lambs. The state also reported a total of 1,426,897 acres of irrigated agricultural land in the state, valued at an average of $45.51 per acre. Wyoming estimates that nonirrigated cropland is valued at 32% of the value of irrigated cropland.

Wyoming's 305(b) report included information from a National Recreation Lakes Study Commission estimate of the economic impact of federal man-made lakes in Wyoming. The estimate is based on visitor days for specific activities. The Commission found that these lakes bring $436 million and 6,300 jobs to the Wyoming economy. The data from this study are summarized in Table 9-8.

Table 9-7. Federal and State Funding for Improvement of Water Quality in Wyoming ($ thousands)

Year	Federal Funding	State Funding
1995 to 1996	$5,353	$3,594
1997 to 1998	$5,089	$3,868
1999 to 2000[a]	$5,026	$4,615

[a]Authorized budget.

Table 9-8. Benefits Derived from Man-Made Lakes of Greater than 1,000 Acre-Feet in Wyoming

Activity	Visitor Days	Total Economic Impact ($ millions)	Total Employment (Jobs)
Fishing	1,215,000	$230	3,300
Boating	626,000	$118	1,700
Swimming	295,000	$12	200
Camping	700,000	$29	400
Wildlife Observation	405,000	$28	400
Other Land Based Recreation	442,000	$19	300
Total	3,683,000	$436	6,300

John H. McShane, Grand River, MI

Controlling Nonpoint Sources

Background

Nonpoint source pollution generally results from land runoff, atmospheric deposition, drainage, or seepage of contaminants. Major sources of nonpoint source pollution include agricultural runoff, runoff from urban areas, and runoff from silvicultural operations. Siltation and nutrients are the pollutants responsible for most of the nonpoint source impacts to the nation's surface waters. These diffuse sources are often harder to identify, isolate, and control than traditional point sources. As a result, from 1972 to 1987, EPA and the states focused primarily on addressing the obvious problems resulting from municipal and industrial discharges: issuing permits for point source discharges, then inspecting, monitoring, and enforcing those permits to ensure that point sources met the Clean Water Act requirements.

Sections 208 and 303(e) of the Clean Water Act of 1972 established the framework to address nonpoint sources of pollution. States and local planning agencies analyzed the extent of NPS pollution and developed water quality management programs to control it with funds provided by EPA under Section 208. Best management practices were evaluated, assessment models and methods were developed, and other types of technical assistance were made available to state and local water quality managers.

The National Section 319 Program

In 1987, Congress enacted Section 319 of the Clean Water Act, which established a more concentrated national program specifically to control nonpoint sources of water pollution. Section 319 created a three-stage national program to be implemented by the states with federal approval and assistance. States were to address nonpoint source pollution by: (1) developing nonpoint source assessment reports, (2) adopting nonpoint source management programs, and (3) implementing the management programs over a multiyear time frame.

All states and territories and 20 American Indian tribes now have EPA-approved nonpoint source assessments. EPA has also approved 56 state and territorial nonpoint source management programs and 20 tribal nonpoint source management programs.

Section 319 also authorizes EPA to issue annual grants to states, territories, and tribes to assist them in implementing their EPA-approved programs, for which the states provide at least a 40% nonfederal dollar match. From FY 1990 through FY 1999, Congress appropriated and EPA awarded approximately $877 million for Section 319 assistance. Funds available for grants in FY 1999 alone have increased to $200 million, which nearly doubled from FY 1998 appropriations.

In 1995, recognizing the growing experience of states, tribes, and localities in addressing nonpoint source pollution and the fact that state, tribal, and local nonpoint source programs had matured considerably since enactment of Section 319 in 1987, representatives of EPA Headquarters, Regions, and the states, under the auspices of the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA), initiated joint discussions to develop a new framework for further strengthening state and local nonpoint source programs. These discussions continued for more than a year, spanning fiscal years 1995 and 1996, and resulted in new national Section 319 program and grant guidance jointly signed by EPA and ASIWPCA and issued by EPA on May 16, 1996. This guidance reflects a joint commitment to upgrade state nonpoint source management programs to incorporate nine key program elements designed to achieve and maintain beneficial uses of water. The guidance also provides for

- Discontinuance of competitive award of a portion of each state's annual Section 319 grant award, thereby assuring each state and territory of a firm annual planning target at the outset of each annual award cycle
- Reduction in the amount and frequency of administrative oversight and reporting
- Greater flexibility for the states, territories, and tribes in establishing priorities for the use of these funds.

The nine key elements that form the core of the new approach are

- The state program contains explicit short- and long-term goals, objectives, and strategies to protect surface and ground waters.
- The state strengthens its working partnerships and linkages to appropriate state, interstate, tribal, regional, and local entities; private sector groups; citizens groups; and federal agencies.
- The state uses a balanced approach that emphasizes both statewide nonpoint source programs and on-the-ground management of individual watersheds where waters are impaired or threatened.
- The state program (1) abates known water quality impairments from nonpoint source pollution and (2) prevents significant threats to water quality from present and future nonpoint source activities.
- The state program identifies water/watersheds impaired by nonpoint source pollution and important unimpaired waters that are threatened or otherwise at risk and establishes a process to progressively address these identified waters by developing and implementing watershed implementation plans.
- The state reviews, upgrades, and implements all program components required by the Clean Water Act and establishes flexible, targeted, and iterative approaches to achieve and maintain beneficial uses of water as expeditiously as practicable.

- The state identifies federal lands and activities that are not managed consistently with state nonpoint source program objectives and, where appropriate, seeks EPA assistance to help resolve issues.

- The state manages and implements its nonpoint source program efficiently and effectively, including necessary financial management.

- The state periodically reviews and evaluates its nonpoint source management program using environmental and functional measures of success and revises its nonpoint source assessment and its management program at least every 5 years.

The guidance also includes a new section on lake protection and restoration activities that encourages the use of Section 319 funds for eligible activities that might have been funded in previous years under Section 314 (the Clean Lakes Program).

Roughly half of each state's annual award supports statewide program activity (staffing, public education and outreach, technical assistance) and half supports specific projects to prevent or reduce nonpoint source pollution at the watershed level.

Funding under Section 319 is also available to American Indian tribes with approved nonpoint source assessment and management programs. Tribal grants are provided under a separate statutory set-aside of the annual Section 319 national appropriation. Because these funds are limited, tribal grants are awarded by EPA Regions but administered by EPA Headquarters. EPA also provides special 319 grant guidance and workshops and consultation to assist tribes in preventing and reducing nonpoint source pollution on their lands.

Clean Water Action Plan Key Actions for Nonpoint Source Pollution

The President's Clean Water Action Plan (February 1998) recognized the need to expedite the effectiveness of state nonpoint source management programs. In so doing, it was announced that "beginning in FY 2000, EPA will award any Section 319 monies exceeding the $100 million authorized level only to those states and tribes that have incorporated all nine key elements (established in the May 1996 guidance) into an approved Section 319 Nonpoint Source Management Program." This means that only approved, upgraded state nonpoint source management programs are eligible to receive the incremental $100 million requested for this program in the President's FY 2000 budget.

As a result, throughout FY 1998 and 1999, EPA has worked closely with the states, territories, and tribes to help upgrade polluted runoff programs to incorporate the nine key elements established in the national guidance.

Section 319 National Monitoring Program

EPA developed the Section 319 National Monitoring Program to improve technical understanding of nonpoint source pollution and the effectiveness of various nonpoint source control technologies. This program selects watershed projects that consistently monitor water quality and land management with standardized protocols for 6 to 10 years. As of April 1999, EPA has approved and funded 22 projects in 18 states. Several of these projects are summarized here.

The **Long Creek** watershed in North Carolina, located 30 miles west of Charlotte, plays host to a mixture of agricultural and urban/industrial land uses, including three dairy operations and several beef and horse farms. High suspended sediment loads, nutrients, and bacteria have impaired sections of the creek, with crop and dairy production believed to be major contributors of nonpoint source pollutants to the creek. One component of the Long Creek project employs an upstream/downstream monitoring design located in a tributary that drains the largest dairy farm in the watershed. Best management practices (BMPs) were installed between the two sites, including livestock exclusion fencing, an alternative water system, improved stock trails, heavy-use-area stabilization, riparian area establishment, and waste storage and handling. Analysis of 80 weeks of data collected since the installation of BMPs documents significant decreases in nitrogen, phosphorus, sediment loads, and bacterial counts. With an 80% decrease in pollutant loads and concentrations, results have thus far exceeded expectations. The Long Creek project will continue until 2001, with plans for additional BMP installations and continued post-BMP monitoring.

The purpose of the **Waukegan River** project was to reduce the sediment load discharge to Lake Michigan from streambank erosion of the Waukegan River. Erosion was caused by increased urban runoff and channelization, problems common in many urban streams. Utilizing Section 319 funds, innovative streambank restoration techniques were implemented to demonstrate how water quality can be improved by stabilizing eroding streambanks and creating stable stream habitat (combining riparian vegetation with structural elements). Effectiveness of the techniques is being documented through EPA's National Nonpoint Source Monitoring Program. This effort incorporates three biological elements—fisheries, benthos, and in-stream habitats—with monitoring stations located both in the downstream treatment reach and on the upstream control reaches. A geographic information system is also being used in the Waukegan River to spatially characterize many of the physical and hydrologic features of the watershed. The physical changes occurring are being correlated with the water quality and biological changes taking place within the watershed. The biological sampling results indicate that the number of fish species and their abundance has more than doubled with the implementation of the chosen techniques.

Otter Creek, one of the Section 319 National Monitoring Program projects, is within the Sheboygan River Priority Watershed, 15 miles west of Lake Michigan, in east-central Wisconsin. Land use in the watershed is 67%

agricultural, with the site of study encompassing a barnyard on Otter Creek with a dairy operation of approximately 50 cows. The stream is typified by reduced aquatic habitat due to excessive sediment and nutrient loading from nonpoint sources—mainly cropland and dairy operations—and recreation is limited by degraded fisheries and high fecal coliform counts. Barnyard BMPs implemented at the site include rainwater diversion and distribution to a grass filter strip, livestock exclusion fencing, and development of a gravel-lined channel crossing that now allows access to the stream. Sampling stations were established on Otter Creek, with one station upstream from a single barnyard-runoff source and the other downstream from that same source (with the intention of minimizing inflows other than runoff from the barnyard). Post-BMP sampling indicated that implementation of barnyard BMPs has reduced the loads of suspended solids by 81%, total phosphorus by 88%, ammonia nitrogen by 97%, BOD by 80%, and microbial loads of fecal coliform bacteria by 84%.

Reports on Section 319 Activities

In 1994, EPA published its first volume of *Section 319(h) Success Stories*, which provided examples of successful solutions to nonpoint source pollution problems in states, territories, and tribes. In 1997, *Section 319(h) Success Stories: Volume II* was published. This second volume demonstrates the maturation of the state programs, replete with many examples of documented water quality improvements, improved fisheries, reduced loadings, and increased public awareness that are a result of the many projects that have received Section 319 funding. The reductions in phosphorus, nitrates, and a lowered fecal coliform count in the lakes, rivers, and streams are successes of the 319 program.

Nonpoint Source Management Programs and Implementation

States, local governments, farmers, community groups, and EPA Regions have initiated many innovative projects across the United States to manage nonpoint source pollution in their waters. The projects described in this section have been published in *Section 319(h) Success Stories: Volume II*. They exemplify the diversity of approaches and settings of Section 319 projects.

Bad River Watershed Project, South Dakota

The Bad River watershed, 3,172 square miles that drain into the Missouri River at Ft. Pierre, South Dakota, consists primarily of highly erodible shallow and dense clays. The river does not support its assigned beneficial uses primarily because its sediment load is 3.25 million tons per year, which also severely impacts the Lake Sharpe impoundment of the Missouri River.

In response, the Bad River watershed steering committee, composed of local residents and government officials, selected a watershed management approach. The first step taken by the steering committee was to conduct a monitoring and assessment program, which revealed that the lower third of the watershed produces two-thirds of the sediment—primarily from gully erosion on grazing lands and streambank scour. The next step toward a solution was to begin a demonstration project in the 250-square-mile Plum Creek subwatershed to illustrate the feasibility of pollution controls. In the Bad River watershed, an array of practices were recommended, including planned grazing systems, proper grazing use, erosion control structures, riparian revegetation, range seedings, water spreader systems, and alternative stock watering facilities.

The results of the demonstration project exceeded expectations and achieved a significant reduction in erosion and sediment delivered to the Bad River. In 1990, Plum Creek delivered 82.7 tons of sediment per acre/foot of runoff. The average annual sediment delivery during 1993 was 10.2 tons of sediment per acre/foot of runoff. The project also achieved substantial landowner participation, with approximately 90% participating in the Plum Creek watershed and approximately 95% of the land under some type of intense management. The watershed residents have supported expansion of the project to the rest of the basin, and demands for technical and financial assistance are about four times the expected levels.

Wetlands to the Rescue – Spragues Cove Stormwater Remediation Project, Massachusetts

In June 1995, Marion, Massachusetts, completed construction of a wetlands system designed to reduce stormwater pollutant discharges that were adversely affecting Spragues Cove. Elevated levels of fecal coliform bacteria were the primary concern; before the wetlands system was built, they had contributed to the closure of shellfish beds in the cove and threatened nearby swimming beaches.

The town joined the Buzzards Bay Project of the National Estuary Program to obtain financial and technical assistance to help build the constructed wetlands system. The wetlands system comprises a sediment basin, two shallow marshes located on both sides of a deep pool, and a stone-lined channel. The project was designed to store 1 inch of runoff with an average detention time of 14 days.

Prior to construction of the wetlands system, fecal coliform counts as high as 20,000 organisms per 100 milliliters were recorded. The latest data now indicate fecal coliform counts of 10 organisms per 100 milliliters in Spragues Cove. In Massachusetts, the Water Quality Standard for shellfish harvesting without depuration is 14 organisms per 100 milliliters. At this time, it appears that the wetlands system has successfully reduced the stormwater pollutant loadings to levels that permit the valuable shellfish beds of Spragues Cove to be open for harvesting.

Protecting the Edwards Aquifer – Urban Development BMPs in Central Texas

Aquatic environments as far downstream as the Gulf Coast (about 150 miles) depend on springs that discharge from the Edwards Aquifer. The aquifer runs under nine counties and serves as the public water supply for numerous communities. Because of the importance of the Edwards Aquifer to the population of central Texas, in 1990 the state initiated formal regulation of nonpoint source pollution in the recharge zone with a revision to the Texas Administrative Code. Under the revised rules, individuals, developers, their agents, or government agencies seeking to develop property in the recharge zone must submit Water Pollution Abatement Plans for approval by the Texas Natural Resource Conservation Commission (TNRCC).

The plans must include descriptions of proposed site disturbance and development, erosion and sediment control plans, a geologic assessment including recharge features, a stormwater pollution mitigation plan, and other site-specific provisions as deemed necessary. This process is supported by Section 319 funding and carried out by the TNRCC's regional offices.

Through the permitting process, developers, construction staff, engineers, and water quality specialists are educated in the application of BMPs for prevention of nonpoint source pollution. As a result, there have been several positive changes in development activities over the recharge zone in recent years and some innovative solutions to satisfy the requirements of Water Pollution Abatement Plan permits.

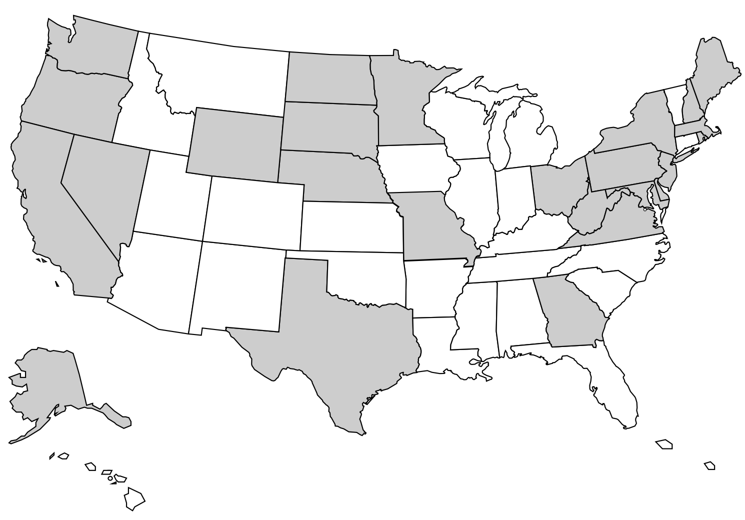
Funding for Nonpoint Source Control

Clean Water State Revolving Fund

In addition to Section 319 funds, many states have taken advantage of the Clean Water State

Figure 10-1

States Using SRF Loans for NPS Programs



Revolving Fund (CWSRF) to provide loans to finance nonpoint source and other water pollution control programs (Figure 10-1). The 1987 Amendments to the Clean Water Act provide states with the opportunity to use these funds for nonpoint source implementation projects and to develop and implement actions under the National Estuary Program.

As of June 1998, CWSRF has provided over $848 million worth of loans toward nonpoint source projects and over $5 million toward estuary projects. Twenty-five states are using CWSRF loans to fund a wide variety of nonpoint source and estuary management projects. CWSRF loans are well suited to funding these types of projects for several reasons: the low-interest nature of the CWSRF program translates into substantial savings—a CWSRF loan can provide up to a 50% or more savings compared with financing at market rates; CWSRF loans can be used to cover 100% of the project costs, including planning and design with loan repayments beginning 1 year after the project is completed; and CWSRF loans carry fewer federal requirements than most federal grants. These advantages can make a CWSRF loan a more appropriate mechanism for funding certain types of nonpoint source controls than a grant, especially one with a high cost-share requirement.

CWSRF may be used to fund implementation of any nonpoint source project eligible for funding under a state's approved Nonpoint Source Management Program. Examples of nonpoint source projects that CWSRF can fund include: agricultural BMPs such as manure storage facilities, no/low-till farm equipment, erosion control, and stream bank buffers; urban and forestry BMPs; wetlands restoration and preservation; ground water, source water, and wellhead protection measures; cleanup of brownfields; repair and replacement of septic tanks; and stormwater controls, among others.

CWSRF funds may be used to develop a Comprehensive Conservation and Management Plan (CCMP) for an estuary and implement any estuary projects that are part of an estuary's CCMP. Such projects may include nonpoint source controls, habitat restoration, and other actions to protect endangered species. (For more information, see *The Clean Water State Revolving Fund; How to Fund Nonpoint Source and Estuary Enhancement Projects*, EPA909-K-97-001, July 1997.)

Coastal Nonpoint Pollution Control Program

Shifts in population toward the coasts, associated development pressures, and other factors moved Congress to provide states with new information and tools to achieve more effective protection of coastal waters from nonpoint pollutants. Congress enacted the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA), which established under Section 6217 a new coastal NPS pollution control program to be incorporated into both state Section 319 CWA programs and state Coastal Zone Management Act (CZMA) programs. NOAA administers the

CZMA and EPA administers Section 319, and the two agencies were jointly charged with implementing Section 6217.

Section 6217 requires that states with federally approved coastal zone management programs develop and implement coastal nonpoint pollution control programs to ensure protection and restoration of coastal waters. Thirty states and territories currently have approved coastal zone management programs.

Under CZARA, state Coastal Nonpoint Pollution Control Programs must provide for implementation of: (1) management measures in conformance with measures published by EPA in national technical guidance, and (2) additional management measures as necessary to attain and maintain state water quality standards where the baseline measures do not accomplish this objective. The CZARA further provides that states' Coastal Zone Management Programs must contain enforceable policies and mechanisms to ensure implementation of the management measures.

EPA issued final technical guidance in January 1993 titled *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. This guidance specifies management measures for five major categories of nonpoint pollution: agricultural runoff, urban runoff, silvicultural runoff, hydromodification, and marinas and recreational boating. The guidance also describes specific practices that may be used to achieve the level of prevention or control specified in the management measures.

EPA and NOAA issued administrative changes to the program guidance in October 1998 to assist the states in developing and implementing final coastal nonpoint pollution control programs. These actions provided greater flexibility to states in prioritizing their activities, extended the implementation period for management measures to 15 years, and clarified a range of enforceable policies and mechanisms that could be used by states to implement their programs.

All states with federally approved Coastal Zone Management Programs submitted nonpoint source programs for EPA and NOAA approval. By the end of FY 98, all of the submitted programs were conditionally approved by EPA and NOAA, requiring states to submit additional information to obtain final program approval. States were allowed up to 5 years after conditional approval to meet the conditions.

The President's Clean Water Action Plan (February 1998) recognized the need to expedite the final approval of state coastal polluted runoff control programs. In so doing, the CWAP established a goal that all programs will be fully approved by December 1999. The recent administrative changes mutually agreed to by states, territories, EPA, and NOAA are also expected to expedite the final approval process. In some cases, the administrative changes may impact previous findings and conditions on state coastal nonpoint programs.

Part II

Individual Section 305(b) Report Summaries and Recommendations

River of Words 1998 Grand Prize Winner (Art, Grades 7-9)
Jennifer Brisson, *Key to the River*, Grade 8, NC

John Theilgard, Puget Sound, WA

State and Tribal Recommendations

In their 1998 Section 305(b) reports, 33 states, tribes, territories, and interstate commissions made recommendations for improving water quality management programs to achieve goals of the Clean Water Act. This discussion summarizes the key recommendations made by these groups and is not intended to serve as a complete inventory or prioritization of these recommendations. While many of the recommendations coincide with current EPA program concerns and priorities, inclusion in this discussion does not imply EPA or Administration endorsement. The most commonly stated recommendations generally addressed the following environmental and programmatic concerns:

- Nonpoint source abatement and watershed protection initiatives
- Toxics contamination
- Ground water pollution and management
- Monitoring and data management
- Financial and resource needs
- Improved outreach.

This chapter briefly summarizes state concerns and recommendations on each of these topics.

Nonpoint Source Abatement and Watershed Protection Initiatives

Most states expressed a common concern for better management of nonpoint sources (NPS) of pollution. Both urban and rural runoff carrying a wide range of pollutants and stressors, such as nutrients, sediment, litter, bacteria, pesticides, fertilizers, metals, and oils, were mentioned.

Examples of Nonpoint Source Concerns

Many states provided examples of their nonpoint source concerns.

- The **District of Columbia** suspects that nonpoint sources are responsible for the high levels of toxic pollutants in river bed sediments.
- **Vermont** comments that wastes generated from large farming operations are equivalent to wastes generated by a small- to medium-sized city.
- **Utah** and **Idaho** report that eutrophication largely due to nonpoint sources is seriously degrading water quality in many of their major reservoirs.

The most frequently reported recommendations address several major concerns:

- *Nonpoint source abatement and watershed protection initiatives*
- *Toxics contamination*
- *Ground water pollution and management*
- *Monitoring and data management*
- *Financial and resource needs*
- *Improved outreach*

Recommendations often cited by the states, tribes, and territories concern NPS pollution.

■ **Rhode Island** believes that a majority of impaired waterbodies on their 303(d) list are degraded due to NPS pollution.

■ Concentrations of the herbicide atrazine are a growing concern in **Nebraska** and are also noted by the **Ohio River Valley Commission**.

Recommended Measures for Nonpoint Source Reduction

Many states report ongoing or recommended measures to reduce nonpoint sources.

■ **Georgia** and **North Dakota** contend that the most effective approaches and measures are likely to be improved watershed management policies, vegetated buffer requirements, and perhaps limitations on pesticide and fertilizer usage.

■ **North Dakota**'s stormwater and NPS programs have coordinated efforts to assist small communities within watershed projects to prevent pollutants from entering runoff.

State and Federal Responsibilities

Many states forwarded recommendations addressing federal/state NPS abatement roles and responsibilities.

■ **Nebraska**'s 305(b) report recommends that the federal government not mandate control of NPS pollution through regulatory programs. Instead, EPA should support the state as it addresses nonpoint source problems through its NPS management program and its watershed-based approach.

■ **New Mexico** states that federal mandates should be developed only after adequate time has been provided to states to fully determine the efficacy of their NPS control programs. They note that the specific nature of nonpoint source problems can vary widely among states.

■ **New Mexico** also notes that the requirement of a nonfederal match of 40% for all Clean Water Act Section 319 grant awards is discouraging federal agencies, who own a third of the land in the state, from instituting appropriate NPS management projects.

■ **North Dakota** notes that it would be beneficial if state funds, administered through grants to priority NPS pollution watersheds, could be made available.

Adopting a Watershed Approach

Many states link NPS monitoring and abatement to adoption of a watershed management approach. Several states report having ongoing initiatives or plans for watershed management approaches as opposed to individual waterbody approaches.

■ The **District of Columbia** is using a watershed approach for the Anacostia River restoration as well as nutrient reduction in the Potomac River. They recommend additional federal funding to support such initiatives.

■ **Arkansas** hopes to establish land use zoning and watershed management plans at local levels to facilitate the development/ protection of state surface and ground water resources.

■ **South Carolina** reports that their Watershed Water Quality Management Program has allowed them to better utilize water quality monitoring resources as well as resources for developing permit limits.

■ **Utah** is developing a geographically focused effort on major watershed management units in the state.

■ **Michigan** reports that some feasibility studies conducted on market-based pollutant trading have shown that it has potential application in watersheds requiring nutrient loading reductions. They anticipate that such trading could provide financial incentives for combined sources (industrial, agricultural, and municipal) and optimize water quality improvement costs, where applicable.

Toxics Contamination

Many reports discuss problems in identification, cleanup, and prevention of various metals and toxic organic pollutants in rivers and lakes, fish tissue, and sediments. They noted point and nonpoint sources of toxics are both widespread. Atmospheric deposition is suspected in increasing levels of mercury in fish in **Arkansas**, **Indiana**, and **Missouri**. In some cases, sources are attributed to ongoing pollution and, in others, as in the case of PCBs and chlordane, to chemicals that continue to persist in the environment long after their use has been banned.

Identification and Assessment

States reported a number of concerns regarding identification and assessment of toxics.

■ **Arkansas** recommends that the detection limits for persistent and carcinogenic organics and highly bioaccumulative compounds be improved.

■ **Georgia** noted that even low levels of metals are a problem because fish are highly sensitive to metals.

■ The **Ohio River Valley Commission** reports that states were not in agreement regarding whether chronic aquatic life criteria violations for total recoverable metals were indicative of conditions toxic to aquatic life.

■ A number of reports mention a lack of data and information on sediment contamination. To address this need, **Nebraska** has begun work on establishing a database for sediment contamination.

■ **Nebraska** also recommends continued EPA Region 7 support for the Regional Ambient Fish Tissue Monitoring Program and the development of ambient water quality criteria documents for chemicals such as atrazine, alachlor, and mirex.

States would like additional regulatory and voluntary means for restoring and protecting ground water and better multidisciplinary and cross-agency participation and cooperation.

Ground Water Pollution and Management

Many states discussed issues and activities relating to ground water pollution and management. Two recurring themes were the need for additional regulatory and voluntary means for restoring and protecting ground water and better multidisciplinary and cross-agency participation and cooperation.

Additional Measures to Protect Ground Water

■ **Arkansas** reports that point and nonpoint ground water contamination sources not regulated under existing programs need to be ranked according to impact potential. They also suggest the need to promulgate water quality standards that would better reflect existing water quality in different aquifers and regions of the state (as in the ecoregion approach for surface waters).

■ **Delaware**, which relies heavily on ground water sources for domestic water needs, reports various contaminants of concern including iron, nitrates, salt water intrusion, and synthetic organic compounds from various sources such as agriculture or leaking underground storage tanks.

■ **Utah** has continuing concerns regarding cleanup of ground water contaminated by historical disposal practices and spills. In response, the state initiated monitoring studies and integrated database development and mapping efforts.

Government Coordination

Several reports mention a general lack of coordination among the many government and nongovernment bodies responsible for various areas of ground water protection.

■ **Utah**'s report notes problems with timely and effective remedial actions and emergency response due to differences in federal and state administrative programs for handling ground water contamination. For example, the pollutant concentrations that require response often vary between state and federal programs.

■ **New Mexico** proposes that ground water protection should remain a state and local concern, with federal support of state/local programs and initiatives. Several states recommend improved hardware and software standards to aid in database development and data exchange.

■ **Missouri** notes that a complete ground water protection program should include a ground water monitoring network and educational programs for transporters of hazardous waste, those involved in applying farm chemicals, and the general public.

Monitoring and Data Management

Improved Monitoring

A common recommendation is the need for better monitoring for specific concerns (e.g., biological integrity, water chemistry, fish tissue, stream flow, sediment contamination, estuarine waters, and ground water) as well as better coordination of monitoring programs.

■ **Rhode Island** reports significant gaps in currently available monitoring data and estimates that some 25% of lake acres and 46% of river miles are unassessed and that streamflow gaging stations are limited.

■ **New Mexico** suggests that biomonitoring tests using warm water species (e.g., fathead minnow) are likely to be inadequate in protecting cold water ecosystems and recommends greater effort in developing methods using cold water species.

■ **Connecticut** recognizes that a probabilistic monitoring design will be necessary to assess low-order streams in the state.

Expanded Electronics Capabilities

Several states (e.g., **South Carolina** and **Rhode Island**) mention the need to expand and improve their computer and electronics capabilities to make data processing and management more efficient.

■ **North Dakota** and **Utah** note that the cross-agency compatibility of ground water databases could be improved.

■ **New Mexico** suggests that federal agencies take on the role of information management and dissemination in areas of interest to all states (such as sampling and monitoring technology, containment and remediation technology, risk assessment, and standards development), rather than states spending limited resources on collecting similar information.

Financial and Resource Needs

Many states expressed the need for additional funding as a result of increasing programmatic demands. Some have adopted measures to maximize resource use by addressing issues on a priority basis. However, others reported that they will be unable to meet even basic needs or priority concerns without additional assistance. For example, Utah notes that new sources of funding must be found to maintain basic water pollution control program functions such as monitoring, inspections, and community assistance.

The states cited multiple environmental and programmatic needs requiring additional resources; some of the most frequently cited were enhancing NPS management programs, better monitoring, improved database management, construction and maintenance of treatment facilities, and cleanup of contaminated resources.

Better monitoring is needed as well as better coordination of monitoring programs.

State Issues Requiring Assistance

■ The **District of Columbia**, **Rhode Island**, and **Vermont** reported problems with combined sewer overflows. The **District of Columbia** states that federal assistance is essential to manage this

Improved public outreach and education is needed, particularly concerning NPS pollution management, waste-water operation and maintenance, and general water quality and resource management.

problem and additional funds are required if any new controls are to be instituted.

■ **Pennsylvania**'s report states that current and projected state and federal funding for abatement and cleanup of abandoned mine drainage is only a small fraction of the amount required.

■ **New York** notes staffing and budget shortages have hampered their monitoring efforts, especially with regard to ground water analytical services.

State Recommendations for Financing

A number of states made requests for additional funding of specific programs.

■ **Rhode Island**, **South Carolina**, and the **District of Columbia** recommend an increase in State Revolving Fund monies to address wastewater and drinking water infrastructure needs.

■ The **District of Columbia** and **Utah** report burdens due to substantial decreases in Section 106 funds.

■ **North Dakota** suggests use of state funds, in the form of grants, for priority NPS watersheds.

States also made recommendations regarding changes in funding allocations.

■ At least two states (the **District of Columbia** and **New Mexico**) noted that required state matches for federal funds are sometimes burdensome.

■ **New Mexico** recommends that Congress provide sufficient dedicated funds to tribes so they can develop and implement effective water quality management programs.

Other suggestions include providing additional general fund appropriations, authorizing increased discharge fees, full funding of Section 1429 of the Safe Drinking Water Act amendments, use of federal highway funds to include stormwater treatment structures, and increased financial assistance to state Underground Injection Control programs.

Improved Outreach

Several reports included recommendations for improved public outreach and education. The most commonly mentioned contexts for outreach were NPS pollution management, wastewater operation and maintenance assistance, and general water quality and resource management.

Pollution Prevention and BMPs

A number of states mentioned a need for greater emphasis on pollution prevention and best management practices for NPS pollution management. This includes educating the public on issues, sources of NPS pollution, and management measures in areas such as livestock operations, zoning and land use, riparian vegetation, and road maintenance. Mechanisms used or recommended include workshops, seminars, public forums, and guidance documents.

■ **Rhode Island, Nevada, Georgia, North Dakota, Vermont,** and **Utah** mentioned the need for continued emphasis, direction, and assistance in this area.

■ **Vermont** has developed a small grant program called "Vermont Better Backroads" to reduce runoff from local roads.

■ **New Mexico** notes that a primary cause of NPDES violations nationwide as well as in New Mexico is the absence of effective operation and maintenance programs to enhance the skills and competence of wastewater treatment plant operators.

Involving the Public

A general theme in some reports was a need for improved outreach for pollution prevention (e.g., water use and conservation), citizen water quality monitoring efforts, wetlands protection, and a combination of voluntary and regulatory efforts to improve the quality of surface and ground water resources.

Special Concerns/ Recommendations

States made recommendations regarding specific regional or local environmental concerns not mentioned above. For example, **Missouri**, **Oklahoma**, **Idaho**, **Pennsylvania**, **the Susquehanna River Basin Commission**, **West Virginia,** and **California** expressed concerns with continuing impacts of abandoned mine drainage. Ongoing problems with managing the zebra mussel, an exotic species, are reported in **Pennsylvania** and **Vermont**. Other issues mentioned include impacts due to channelization, ongoing wetlands protection and restoration issues, impacts of silviculture on water quality, coastal habitat restoration, lake management, and water quality impacts from increased recreational use and development.

Salton Sea

Several tribes in southern California, as well as the state, mentioned a need for better monitoring and regional cooperation in response to avian botulism and other indicators of fish and wildlife impacts in and around the Salton Sea. These tribes also recommend improving general surface and ground water monitoring and developing beneficial uses for their waters along with associated criteria to assess use support.

Regional concerns include abandoned mine drainage, zebra mussel management, and restoring the Salton Sea.

Conclusions

Many state concerns have root causes in resource constraints, lack of existing data or information, or lack of coordination among multiple bodies responsible for the same issue areas. The states and other governing entities recommended that Congress address financial/ resource problems so that, at a minimum, basic and priority activities can be implemented. The importance of public involvement is emphasized, especially for dealing with complex problems such as NPS pollution, where control options are difficult or expensive. Flexibility in developing programs tailored to individual conditions and needs is recommended especially for issues that can vary widely among regions, such as ground water and NPS pollution management. Critical areas requiring improved monitoring and data development, such as toxics and stream flow, are identified. The reports also suggest the need for proper coordination and data integration among different programs to enhance efficiency and help optimize use of scarce resources.

Christine, Grade 1, OH

Amazon Slough Watershed

All summer long they come–
with or without dogs,
in loose, slow-moving bunches or alone,
hiking the steep, narrow path past the blackberries,
past the stream that is little more than a trickle now
in the hot depths of summer.

In the winter the stream swells–a vein, a pulsing artery of water
for deer that trip down from the forest's edge,
for raccoons that hide by daylight beneath our deck.
Chickadees, nuthatches, pine siskins
fly in and out of low brambly willows that line the banks.

The stream dips beneath the surface,
through pipes, culverts, under streets
and out again, into the wan winter sun,
a quarter of a mile away where it joins the slough,
brown floodwaters mingling.

Past ash and cottonwood,
in and out of cattails, willows,
past the place where each year
a family of ducks return
faithful to the stream,
and the huge blue heron is sometimes seen.

Moving toward the river,
where geese honk overhead,
and finally to its end
in the marshy reservoir,
the tiny stream which began
across our street
has traveled eighteen long miles
and now mingles with other waters,
glistening in the sun.

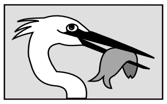
River of Words 1999 Grand Prize Winner (Poetry, Grades 3-6)
Aaron Wells, Age 12, OR

John H. McShane, Nisqually River, Mt. Ranier, WA

State and Territory Summaries

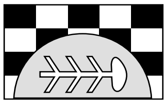
This section provides individual summaries of the water quality assessment data reported by the states and territories in their 1998 Section 305(b) reports. The summaries provide a general overview of water quality conditions and the most frequently identified water quality problems in each state and territory. However, the use support data contained in these summaries are not comparable because the states and territories do not use comparable criteria and monitoring strategies to measure their water quality. States and territories with strict criteria for defining healthy waters are more likely to report that a high percentage of their waters are in poor condition. Similarly, states with progressive monitoring programs are more likely to identify water quality problems and to report that a high percentage of their waters do not fully support designated uses. As a result, one cannot assume that water quality is worse in those states and territories that report a high percentage of impacted waters in the following summaries.

Section 305(b) of the CWA requires that the states biennially assess their water quality for attainment of the fishable and swimmable goals of the Act and report the results to EPA. The states, participating tribes, and other jurisdictions measure attainment of the CWA goals by determining how well their waters support their designated beneficial uses. EPA encourages states, tribes, and other jurisdictions to assess waterbodies for support of the following individual beneficial uses:



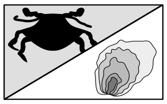
Aquatic Life Support

The waterbody provides suitable habitat for protection and propagation of desirable fish, shellfish, and other aquatic organisms.



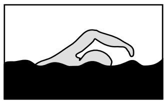
Fish Consumption

The waterbody supports fish free from contamination that could pose a human health risk to consumers.



Shellfish Harvesting

The waterbody supports a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.



Primary Contact Recreation – Swimming

People can swim in the waterbody without risk of adverse human health effects (such as catching waterborne diseases from raw sewage contamination).

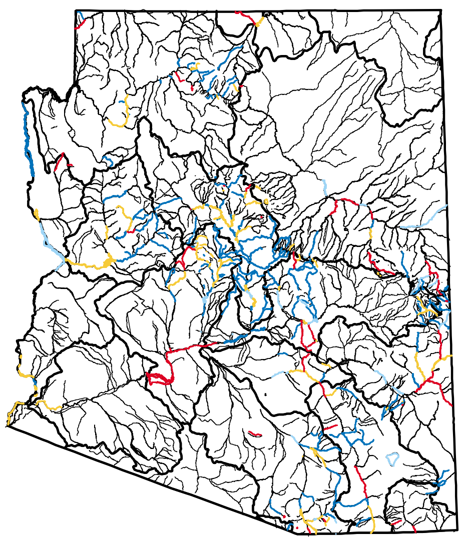
HIGHLIGHT HI GHT HIGHLIGHT

Color Maps in the State and Territory Summaries

This National Water Quality Inventory includes color maps displaying use support for 35 states that supplied their use support assessments to EPA in an electronic format, such as a database.

Depending on the type of data submitted, EPA generated three different types of color maps. Two of them illustrate the aquatic life use support attainment status of specific waterbodies. These could only be prepared for the 15 states that georeferenced* their assessment findings to specific waterbodies. The two types of maps reflect the level of precision reported. One type shows the attainment status of assessed waterbodies (Figure 1). The other type colors each assessed waterbody based on the percent of the waterbody that is fully supporting aquatic life use (Figure 2). In most cases, these two types of maps show all the assessment data for an entire state. In the few instances where a statewide map would be difficult to read, only the assessments from one or two basins are shown.

The third type of map presents assessment data that were georeferenced* to a watershed rather than to a specific waterbody (Figure 3). These maps color an entire watershed based on the percent of assessed waters that are fully supporting all uses. These maps present the most generalized view of water quality.



Fully Supporting
Threatened
Partially Supporting
Not Supporting
Not Assessed
Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

This map depicts aquatic life use support status.

Figure 1. Color map showing the aquatic life attainment status of each assessed waterbody.

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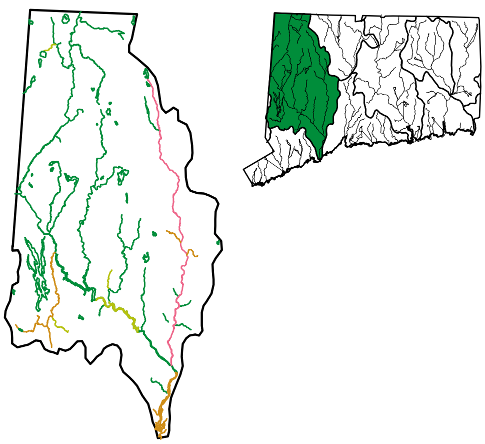
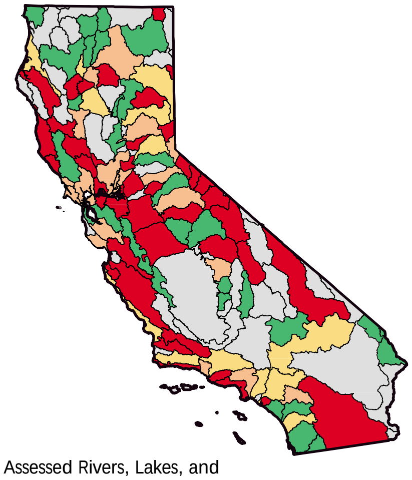
*Georeferencing describes the process of locating a waterbody in coordinates that can be used in a geographic information system (GIS).



— Segment 80% -100% Fully Supporting
— Segment 50% - 79% Fully Supporting
— Segment 20% - 49% Fully Supporting
— Segment 0% - 19% Fully Supporting
— Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

This map depicts aquatic life use support status.

Figure 2. Color map showing the percent of each assessed waterbody fully supporting aquatic life use support.

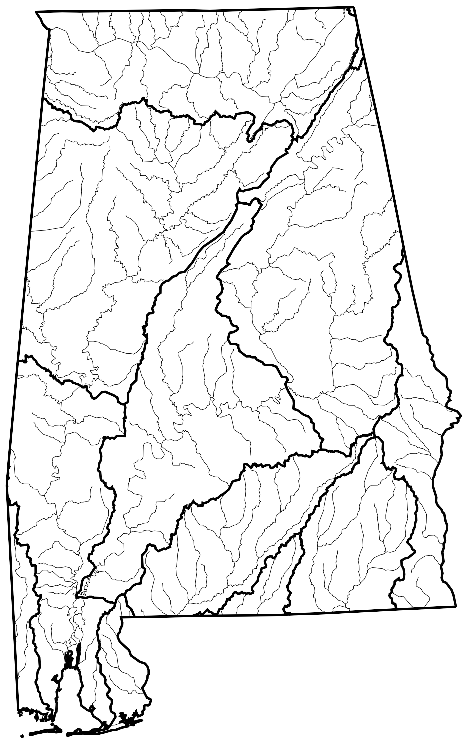


Percent of Assessed Rivers, Lakes, and Estuaries Meeting All Designated Uses

- 80% - 100% Meeting All Uses
- 50% - 79% Meeting All Uses
- 20% - 49% Meeting All Uses
- 0% - 19% Meeting All Uses
- Insufficient Assessment Coverage
- Basin Boundaries
(USGS 8-Digit Hydrologic Unit)

Figure 3. Color map showing the percent of the assessed waterbodies in each watershed fully supporting all uses.

Alabama



Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Alabama 1998 305(b) report, contact:

Michael J. Rief
Alabama Department of
Environmental Management
Water Quality Branch
P.O. Box 301463
Montgomery, AL 36130-1463
(334) 271-7829
e-mail: mjr@adem.state.al.us

The report is also available on the Internet at: *http://www.adem.state.al.us/305bwebpg.html*

Surface Water Quality

Since enactment of the Clean Water Act of 1972, water quality has substantially improved near industrial and municipal facilities. However, pollution still prevents about 5% of the surveyed stream miles from fully supporting state-defined overall use. In addition, 19% of surveyed lake acres do not fully support aquatic life use and 84% of surveyed estuarine square miles do not fully support shellfishing use. Oxygen-depleting wastes and pathogens are the most common pollutants impacting rivers and coastal waters. The leading sources of river pollution include agriculture, municipal wastewater treatment plants, and urban runoff and storm sewers. In coastal waters, the leading sources of pollution are urban runoff and storm sewers, municipal point sources, and collection system failures.

Toxic priority organic chemicals impact the most lake acres, usually in the form of a fish consumption advisory. These pollutants may accumulate in fish tissue at a concentration that greatly exceeds the concentration in the surrounding water. Unknown sources and industrial dischargers are responsible for the greatest acreage of impaired lake waters.

Special state concerns include impacts from forest clearcutting and lack of streamside management zones. Animal waste runoff is another special concern that is being dealt with through an operation registration rule.

Alabama did not report on the condition of wetlands.

Ground Water Quality

The Geological Survey of Alabama monitoring well network indicates relatively good ground water quality. However, the number of ground water contamination incidents has increased significantly in the past few years due to better reporting under the Underground Storage Tank Program and increased public awareness of ground water issues. Alabama has established pesticide monitoring and a Wellhead Protection Program to identify nonpoint sources of ground water contamination and further protect public water supplies.

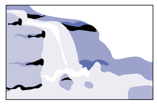
Programs to Restore Water Quality

Alabama's nonpoint source management program initiated a 5-year rotational watershed management schedule approach beginning in 1996. The approach involves assessing and identifying the causes and sources of nonpoint source impacts, prioritizing impacted watersheds, and providing resources to protect or improve water quality. The first river basin assessments were conducted in 1996-1997 in the Lower Cahaba and Black Warrior River basins. Other priorities of the nonpoint source program include demonstrating best management practices (BMPs); raising public awareness through education, training, and initiatives; and developing, prioritizing, and implementing nonpoint source total daily maximum loads.

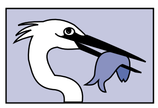
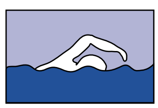
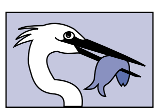
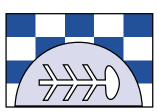
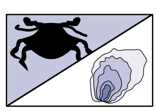
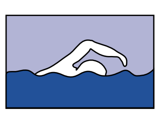
Programs to Assess Water Quality

During the 1980s, Alabama implemented a multifaceted approach to surface water quality monitoring. This approach included a fixed-station monitoring network, reservoir monitoring, intensive waterbody-specific studies, fish tissue sampling, and compliance monitoring of point source discharges. In 1996, the state proposed ASSESS, a watershed-based strategy to integrate surface water quality monitoring with defined water quality objectives and associated environmental indicators. The objectives of ASSESS include improving monitoring coverage within river basins, improving spatial detail of water quality assessments, and increasing total stream miles monitored over the 5-year rotation period.

Summary of Use Support in Alabama

		Percent		
		Good (Fully Supporting)	Good (Threatened)	Impaired (For One or More Uses)
Rivers and Streams (Total Miles = 77,274)[b]				
	Total Miles Assessed 2,987	95	-	5

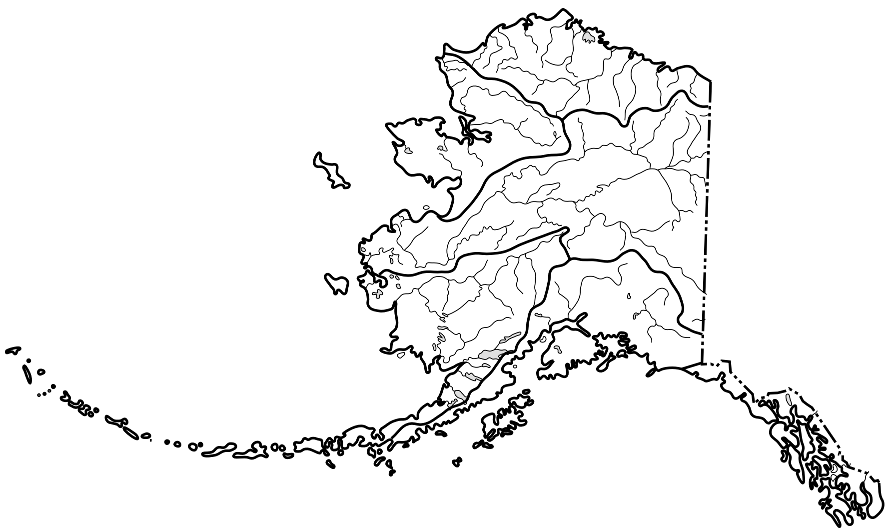
Individual Use Support in Alabama

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Lakes (Total Acres = 490,472)						
	Total Acres Assessed 463,115	67	15	17	2	0
	463,111	78	5	9	7	0
	415,036	77	19	4	<1	0
Estuaries (Total Square Miles = 610)						
	Total Square Miles Assessed 610	100	0	0	0	0
	610	100	0	<1	0	0
	497	16	0	84	0	0
	583	100	0	0	<1	0

– Not reported in a quantifiable format or unknown.
[a] A subset of Alabama's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Alaska



Basin Boundaries (USGS 6-Digit Hydrologic Unit)

For a copy of the Alaska 1998 305(b) report, contact:

Drew Grant
Alaska Department of Environmental Conservation
Division of Air and Water Quality
410 Willoughby Street - Suite 105
Juneau, AK 99801-1795
(907) 465-5304
e-mail: dgrant@environ.state.ak.us

Surface Water Quality

The vast majority of Alaska's watersheds, while not being monitored, are presumed to be in relatively pristine condition due to Alaska's size, sparse population, and general remoteness. However, Alaska has localized water pollution. Surface water quality has been found to be impaired or threatened from sources such as urban runoff (Fairbanks, Anchorage, and Juneau), mining operations in the Interior and Northwest Alaska, seafood processing facilities in the Aleutian Islands, and forest products facilities in southeast Alaska.

Alaska did not report on the condition of wetlands.

Ground Water Quality

Ground water is one of Alaska's least understood natural resources. It is the major source of fresh water for public and private drinking water supply systems, industry, and agricultural development. Although ground water is presumed to be of excellent quality in most areas of the state, specific areas of generally good ground water quality have been degraded by human activities. Ground water impairment has been documented in various areas of the state and has been linked predominantly to aboveground and subsurface petroleum storage facilities, as well as operational and abandoned military installations. Other sources, such as failed septic systems, also contribute to ground water contamination.

Programs to Restore Water Quality

The Alaska Department of Environmental Conservation (ADEC) has developed the Watershed Management Section, within the Division of Air and Water Quality, to implement the watershed protection approach that has been used successfully in other states. The purpose of this approach is to cost-effectively improve the water quality of Alaska's polluted waterbodies and to protect its healthy watersheds in cooperation with other agencies, industry, interest groups, and the public. The process to be used to advance the watershed protection approach in Alaska is outlined in the document *Watershed Partnerships in Alaska*.

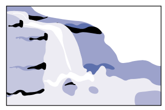
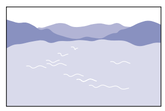
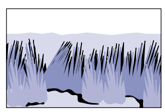
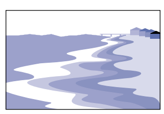
ADEC also supports numerous additional water quality projects and programs statewide, including: pollution prevention, leaking underground storage tanks, contaminated sites, industrial permitting, waterbody assessments and recovery plans, water quality monitoring, water quality technical services, and public outreach and education from statewide public service offices.

Programs to Assess Water Quality

The Alaska Watershed Monitoring and Assessment Project (AWMAP) is a statewide water quality monitoring project involving local, state, and federal agencies; industry; schools; the University of Alaska; and other entities conducting water quality monitoring. A recent AWMAP report identified areas of the state (by USGS hydrologic unit) where water quality monitoring is either absent or insufficient to address the potential pollution sources.

Other water quality monitoring activities are conducted by ADEC, other agencies, industry, and the public. Applicant self-monitoring of receiving waters is a common permit requirement associated with Alaska's major point source dischargers. ADEC, in cooperation with the Alaska Department of Natural Resources (ADNR), has periodically conducted water quality monitoring related to placer mining. Implementation of the State Ground Water Quality Protection Strategy is continuing, encouraging increased ground water monitoring.

Summary of Use Support[a] in Alaska[b]

		Percent		
		Good (Fully Supporting)	Good (Threatened)	Impaired (For One or More Uses)
Rivers and Streams (Total Miles = 365,000) 	Total Miles Assessed: 513	1	-	99
Lakes (Total Acres = 12,787,200) 	Total Acres Assessed: 4,719	0	-	100
Estuaries (Total Square Miles = 33,257) 	Total Square Miles Assessed: 237	1	-	99
Ocean Shoreline (Total Miles = 44,226) 	Total Shoreline Miles Assessed: 4	0	-	100

– Not reported in a quantifiable format or unknown.

[a] A summary of use support data is presented because Alaska did not report individual use support in their 1998 Section 305(b) report.

[b] Alaska notes its assessments are biased toward those waters with known impairments.

Note: Figures may not add to 100% due to rounding.

American Samoa

Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the American Samoa 1998 305(b) report, contact:

Carl Goldstein
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105
(415) 744-2170
e-mail: goldstein.carl@epa.gov

Surface Water Quality

The Territory of American Samoa (AS) is located about 2,300 miles southwest of Hawaii and consists of five islands with a total of 116 miles of shoreline and approximately 160 streams.

Although becoming more westernized, American Samoa still retains traditional Polynesian systems of leadership, land tenure, and family alliances. Due to cultural differences, environmental policies are not always effective.

Streams in American Samoa serve as sources of potable water and places for recreational and subsistence fishing for many villages. While there are no significant point sources of pollutants, nonpoint sources (stormwater runoff, erosion, agricultural practices, road building, careless solid waste disposal, and individual sewer systems) contribute to a reduction in stream quality. This has resulted in a loss of aquatic habitat as well as increased sedimentation, and turbidity. Monitoring data for fecal coliform indicate that the water quality of almost every stream consistently exceeds the established standards.

Coastal waters immediately adjacent to villages show limited water quality degradation, so the protected uses for open coastal and ocean waters appear to be met. Two to five miles out from the islands, American Samoa's tuna canneries are permitted to dump cannery sludge and other wastes. In general, compliance with the Ocean Dumping permit has been satisfactory.

Because it is subjected to the greatest amount of anthropogenic or human-generated pollution, Pago Pago Harbor has been identified as an impaired waterbody due to elevated levels of lead and tributlytin in sediment and fish tissue. Also, large oil spills occur several times a year. To reduce the impacts of the spills, the U.S. Coast Guard and AS EPA worked together to develop an Oil Spill Protocol and a 24-hour harbor surveillance program.

American Samoa did not report on the condition of wetlands.

Ground Water Quality

The majority of potable water for the government water system comes from ground water in the Tafuna-Leone Plain on Tutuila. In a 1987 study, ground water contamination was attributed to soil bacteria, particulates, human and animal wastes, poor well construction, and the high permeability/low soil filtration capacity. A 1989 study found that total coliform bacteria concentrations in well waters are readily detectable after heavy rainfall; otherwise, all regulated contaminants are within EPA Safe Drinking Water Standards.

Programs to Restore Water Quality

Based on a 1988 assessment report, the Nonpoint Source Management Program was created to encourage best management practices. Completed projects include soil stabilization demonstration projects, septic tank training, waste oil collection, soil erosion regulations, plan guidelines for developers, watershed cleanup projects, storm water planning, and public education. In 1990, the American Samoa Coastal Nonpoint Pollution Control Program required BMPs for sediment and erosion, stormwater, and construction site controls for all new development.

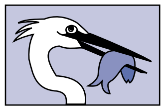
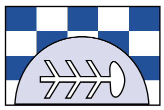
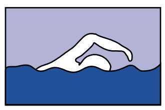
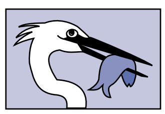
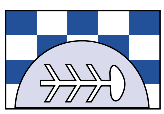
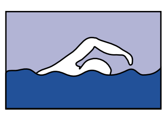
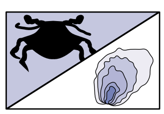
A Wetlands Management Plan has initiated delineation and restoration programs and the ASEPA has begun riparian habitat restoration projects for 10 streams on Tutuila Island.

Ground water restoration efforts include sewer and sewage treatment plant construction, public education, and a water conservation program.

Programs to Assess Water Quality

A baseline water quality study in 1979 led to the completion of the first water monitoring strategy in 1984. Five rivers and 13 Pago Pago Harbor sites are sampled for physical and chemical parameters, and 15 streams and 21 beaches are tested for biological contamination.

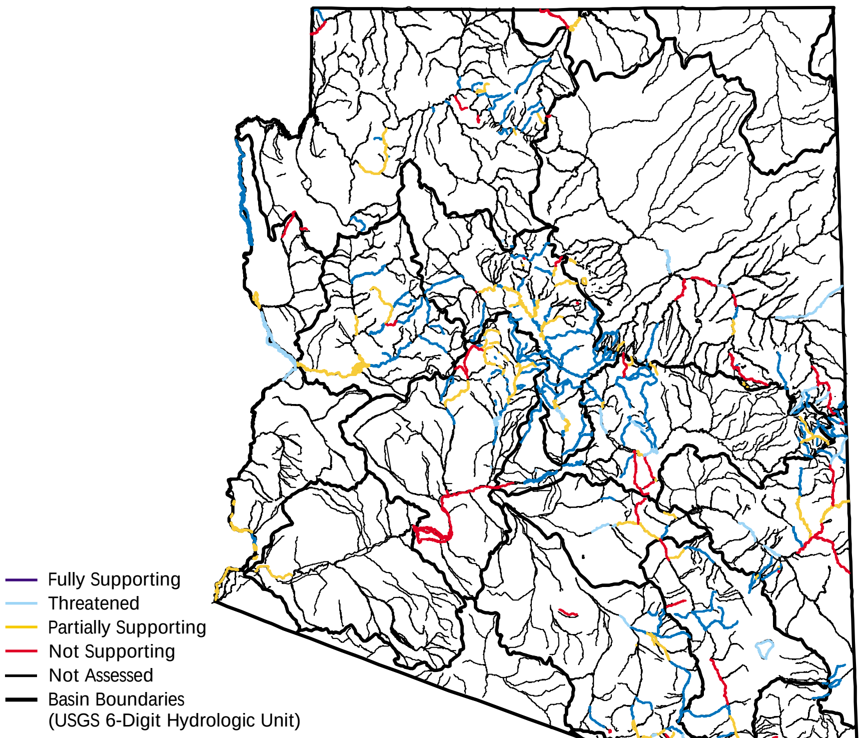
Individual Use Support in American Samoa

Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = unknown)						
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Ocean Shoreline (Total Miles = 116)						
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

– Not reported in a quantifiable format or unknown.

[a] A subset of American Samoa's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

Arizona



This map depicts aquatic life use support status.

For a copy of the Arizona 1998 305(b) report, contact:

Diana Marsh
Arizona Department of
Environmental Quality
3033 North Central Avenue
Phoenix, AZ 85012
(602) 207-4545
e-mail: marsh.diana@ev.state.az.us

The report is also available on the Internet at: *http://www.adeq.state.az.us/water/assess*

Surface Water Quality

Good water quality fully supports aquatic life uses in 62% of Arizona's assessed stream miles and 66% of its surveyed lake acres. This means that 38% of its assessed stream miles and over 33% of its lake acres do not fully support aquatic life uses. Turbidity, metals, pathogens, and pH were the four stressors most frequently identified in streams. The leading stressors in lakes were metals, pH, inorganics, and turbidity. Natural sources, agriculture, and resource extraction were the three most common sources of stressors in streams. In lake assessments, flow regulation is added as a primary source of stressors.

Arizona did not report on the condition of wetlands.

Ground Water Quality

Arizona monitors a network of ambient water quality index wells and compiles data from other monitoring programs, which are primarily targeted in areas of known or suspected contamination. Data were reviewed in two watersheds and five “active management areas” (areas targeted as imperiled by overdraft of ground water resources by the Arizona Department of Natural Resources).

Ground water contamination varies significantly across the state. Natural fluoride levels exceed standards and are a major drinking water concern in several basins. In the metropolitan areas, volatile and semivolatile organic compound (VOC and SOC) contamination areas are being remediated by the federal and state Superfund programs.

Programs to Restore Water Quality

Arizona’s nonpoint source control program integrates regulatory controls with nonregulatory education and demonstration projects.

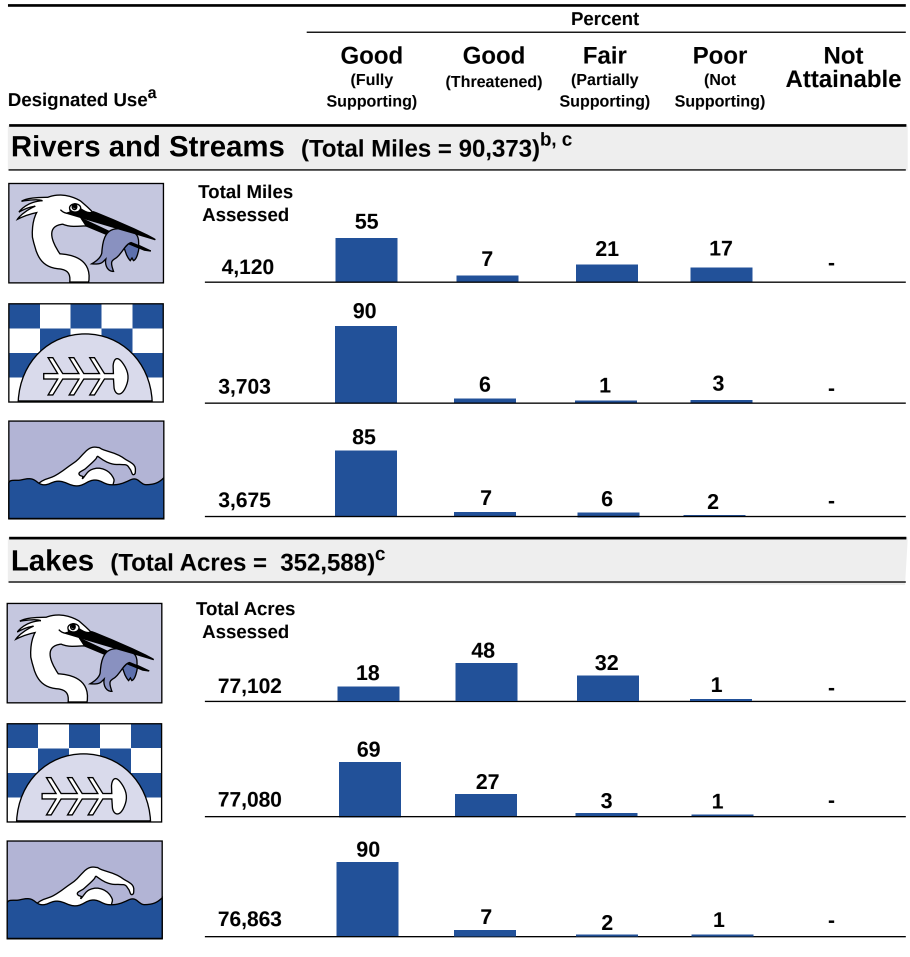
Regulatory programs include the Aquifer Protection Permit Program, the Pesticide Contamination Prevention Program, and best management requirements for controlling nitrogen at concentrated animal feeding operations. The state is also developing best management practices for timber activities, grazing activities, urban runoff, and sand and gravel operations. Arizona's point source control program encompasses planning, facility construction loans, permits, pretreatment, inspections, permit compliance, and enforcement.

Additionally, the state's Water Protection Fund provides a source of funding to restore rivers and associated riparian habitats.

Programs to Assess Water Quality

Federal and state agencies continue efforts to coordinate monitoring, provide more consistent monitoring protocols, and provide mechanisms to share data, spurred by tightened budgets. Monitoring programs in Arizona include a fixed station network, stream ecosystem monitoring, priority pollutant monitoring, and monitoring to support development of criteria. Biological and physical integrity criteria are being developed by the Arizona Department of Environmental Quality, which will recognize regional differences in biological community structure and stream morphology.

Individual Use Support in Arizona



– Not reported in a quantifiable format or unknown.

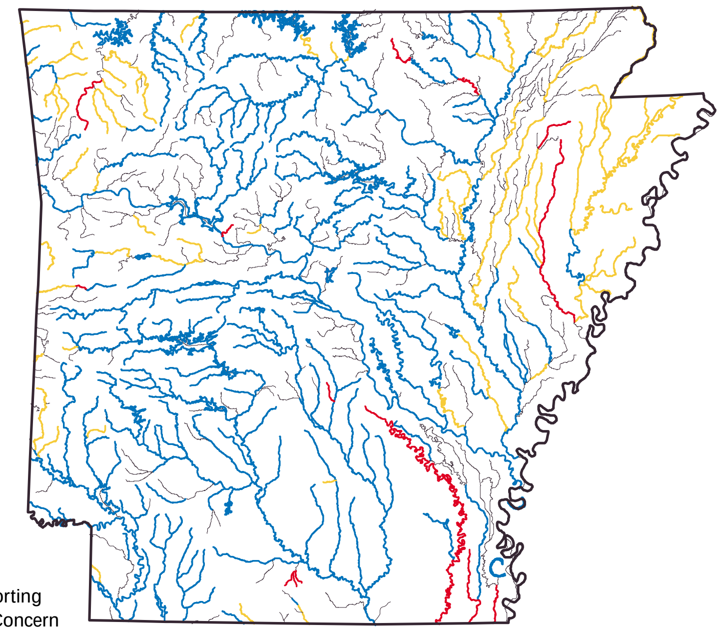
[a] A subset of Arizona's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes 2,531 miles of nonperennial streams that dry up and do not flow all year.

[c] Does not include waters on tribal lands, which total 37,130 stream miles and 65,128 lake acres.

Note: Figures may not add to 100% due to rounding.

Arkansas



This map depicts aquatic life use support status.

For a copy of the Arkansas 1998 305(b) report, contact:

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Environmental Quality
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Surface Water Quality

The Arkansas Department of Environmental Quality reported that 69% of their surveyed rivers and streams and 100% of their surveyed lake acres have good water quality that fully supports aquatic life uses. Good water quality also fully supports swimming use in 93% of the surveyed river miles and 100% of the surveyed lake acres. Siltation and turbidity are the most frequently identified pollutants impairing Arkansas' rivers and streams, followed by bacteria, nutrients, and metals. Agriculture is the leading source of pollution in the state's rivers and streams and has been identified as a source of pollution in four lakes. Municipal wastewater treatment plants, mining, industrial discharges, and construction also impact rivers and streams. Arkansas has limited data on the extent of pollution in lakes.

Special state concerns include the development of TMDLs and more effective methods to identify nonpoint source impacts. Arkansas is also concerned about impacts from the expansion of confined animal production operations and major sources of turbidity and silt including road construction, road maintenance, riparian land clearing, streambed gravel removal, and urban construction.

Arkansas did not report on the condition of wetlands.

Ground Water Quality

Aquifer monitoring indicates that ground water quality in Arkansas is generally good. Secondary maximum contaminant wells were exceeded in a number of locations for parameters such as pesticides, iron, and manganese. Potential sources of contamination include disposal sites, underground storage sites, agriculture, and mining operations.

Programs to Restore Water Quality

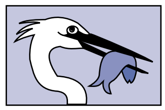
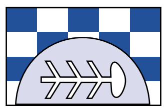
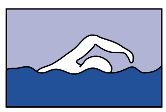
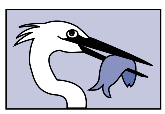
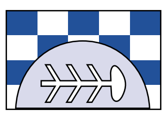
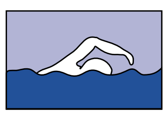
The Arkansas Nonpoint Source Pollution Management Program is currently being revised to include all categories of NPS pollution. It provides for continued monitoring of water quality, research into the effectiveness of BMPs, and implementation strategies for BMPs. Beginning in 1997, a Priority Water Program was developed to target NPS-impacted watersheds for BMP implementation. Ten watersheds were selected for either more intensive survey activities or BMP implementation activities.

Programs to Assess Water Quality

Arkansas classifies its water resources by ecoregion with similar physical, chemical, and biological characteristics. There are six ecoregions including the Delta, Gulf Coastal, Ouchita Mountain, Arkansas River Valley, Boston Mountain, and Ozark Mountain Regions. By classifying water resources in this manner, Arkansas can identify the most common land uses within each region and address the issues that threaten the water quality.

The state's ambient monitoring network includes 133 stations monitored monthly for several key water quality parameters. Many of these stations have been monitored for 15 to 20 years or longer. In addition, 103 additional stations sampled quarterly were added in 1994 to assess previously unassessed waters or waters that have not been monitored in several years. The data analyzed for this report were collected from October 1995 through September 1997.

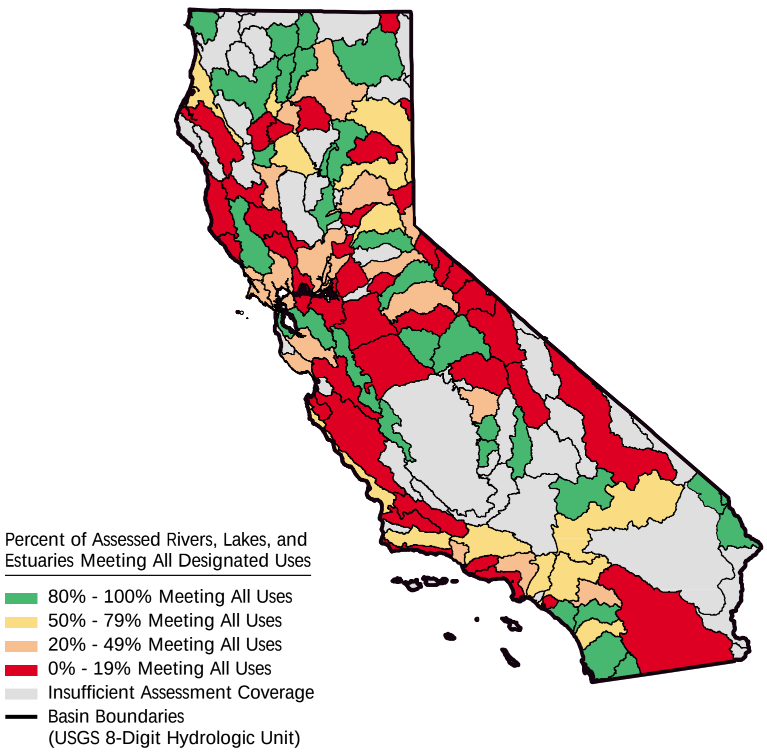
Individual Use Support in Arkansas

Designated Use[a]		Percent Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 87,617)[b]	Total Miles Assessed					
	8,668	69	-	22	8	-
	8,668	95	-	<1	5	-
	7,479	93	-	7	<1	-
Lakes (Total Acres = 514,245)	Total Acres Assessed					
	356,254	100	-	0	0	-
	356,254	95	-	-	5	-
	356,254	100	-	0	0	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Arkansas' designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

California



For a copy of the California 1998 305(b) report, contact:

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Control Board, M&A
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Surface Water Quality

Siltation, metals, nutrients, bacteria, and pesticides impair the most river miles in California. The leading sources of degradation in California's rivers and streams are agriculture, forestry activities, urban runoff and storm sewers, and municipal point sources. In lakes, siltation, metals, and nutrients are the most common pollutants. Hydrologic and habitat modifications, along with urban runoff/storm sewers, construction, highway maintenance and runoff, and atmospheric deposition pose the greatest threat to lake water quality.

Metals, pesticides, PCBs, and priority organics are the most frequently identified pollutants in estuaries, harbors, and bays. Urban runoff and storm sewers are the leading source of pollution in California's coastal waters, followed by spills, agriculture, resource extraction, and septage disposal.

Ground Water Quality

Salinity, total dissolved solids, and chlorides are the most frequently identified pollutants impairing use of ground water in California, followed by priority organic chemicals, nutrients, nonpriority organic chemicals, and pesticides. Leading sources are septage disposal, agriculture, and dairies. Potential sources of ground water contamination include leaking underground storage tanks, septage disposal, agriculture, and industrial point sources.

Programs to Restore Water Quality

Through California's stormwater permit program, two statewide general permits have been adopted addressing stormwater discharges associated with industrial activities. Dischargers are required to eliminate most nonstormwater discharges, develop a stormwater pollution prevention plan to identify and implement control measures to minimize pollutants in stormwater runoff, and monitor their discharges.

The State Water Resources Control Board and Regional Water Quality Control Boards are implementing a Watershed Management Initiative to better coordinate and focus limited public and private resources to address both point and nonpoint source water quality problems especially in high-priority targeted watersheds.

Programs to Assess Water Quality

California has developed a number of programs to monitor water quality in fresh, estuarine, and marine waters of the state. These include a Toxic Substances Monitoring Program that focuses on areas with known or suspected impairment; the Toxicity Testing Program for the identification of high-risk areas as well as the spatial and temporal extent of water quality problems and their causes and sources; an underground storage tank program to study the cleanup of leaking tanks; and volunteer monitoring.

Programs that focus on saltwater monitoring include the California State Mussel Watch Program to detect toxic substances in bays, harbors, and estuaries and the Bay Protection and Toxic Cleanup Program to identify toxic hot spots in enclosed bays and estuaries. California is also developing a comprehensive program for monitoring and reducing pollution in California's coastal zone.

– Not reported in a quantifiable format or unknown.

[a] A subset of California's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

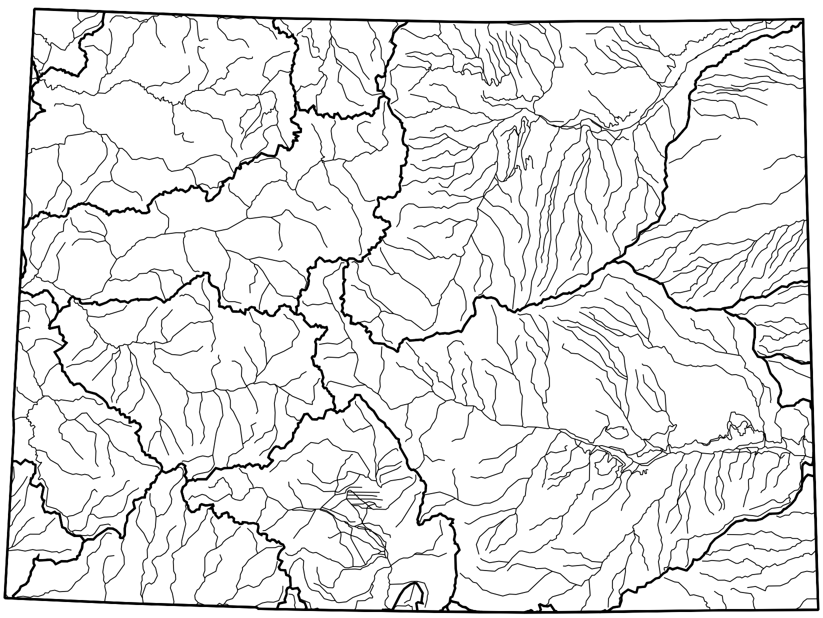
[c] Includes bays and harbors.

Note: Figures may not add to 100% due to rounding.

Individual Use Support in California

Designated Use[a]	Total Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 211,513)[b]	Total Miles Assessed					
	12,289	24	12	49	16	-
	8,075	29	9	59	2	-
	12,066	24	11	48	17	-
Lakes (Total Acres = 1,672,684)	Total Acres Assessed					
	683,248	25	8	48	19	-
	490,343	28	12	35	26	-
	675,736	25	11	46	19	-
Estuaries (Total Square Miles = 1,008)[c]	Total Square Miles Assessed					
	870	27	<1	67	5	-
	880	30	2	65	3	-
	749	36	3	60	1	-
	785	34	<1	65	1	-
Wetlands (Total Acres = 275,812)	Total Acres Assessed					
	27,117	55	1	43	<1	-
	338	51	0	0	49	-
	24,869	61	2	36	1	-

Colorado



Basin Boundaries (USGS 6-Digit Hydrologic Unit)

For a copy of the Colorado 1998 305(b) report, contact:

Sarah Johnson
Colorado Department of Public Health and Environment
Water Quality Control Division
4300 Cherry Creek Drive, South
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Surface Water Quality

Colorado reports that 96% of its surveyed river miles and 88% of its surveyed lake acres have good water quality that fully support aquatic life uses. Metals are the most frequently identified pollutant in rivers and lakes. Mining and agriculture are leading sources of pollution in both rivers and lakes.

Colorado did not report on the condition of wetlands.

Ground Water Quality

Ground water quality in Colorado ranges from excellent in mountain areas where snow fall is heavy, to poor in certain alluvial aquifers of major rivers. Naturally occurring soluble minerals along with human activities are responsible for significant degradation of some aquifers. Nitrates and salts from agricultural activities have contaminated many of Colorado's shallow, unconfined aquifers. In mining areas, acidic water and metals contaminate aquifers. Colorado protects ground water quality with statewide numeric criteria for organic chemicals, a narrative standard to maintain ambient conditions or maximum contaminant levels of inorganic chemicals and metals, and specific use classifications and standards for ground water areas. Colorado also regulates discharges to ground water from wastewater treatment impoundments and land application systems with a permit system.

Programs to Restore Water Quality

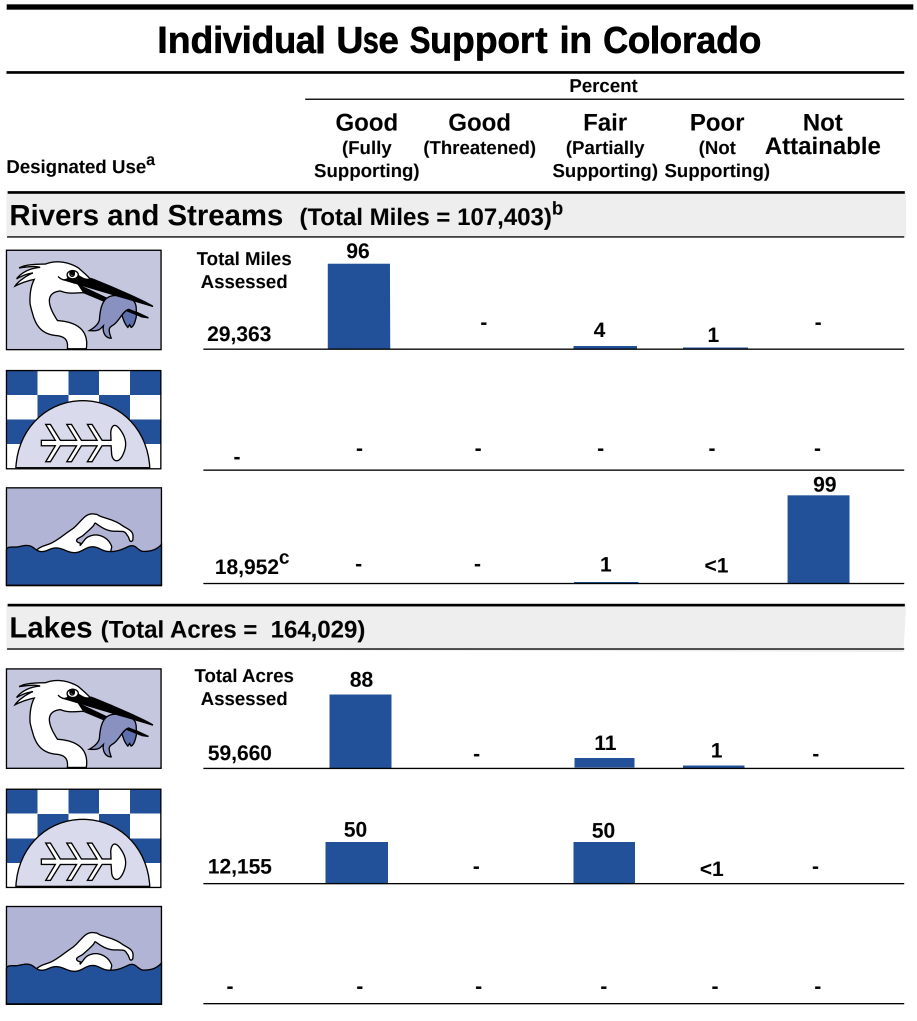
Colorado's Water Quality Control Division recently reorganized to streamline the Division and to make it more responsive to major new trends in water quality management. The cornerstone of the new organization is the creation of watershed coordinators and watershed teams for the four major watersheds in the state: Arkansas/

Rio Grande, Lower Colorado, Upper Colorado, and South Platte. The watershed coordinators make the Division more responsive to local communities and their concerns. The watershed teams give the Division the ability to address key issues using an integrated approach, which will lead to more effective solutions.

Other programs in Colorado include the state's Water Pollution Control Revolving Fund, nonpoint source control program, and permits programs.

Programs to Assess Water Quality

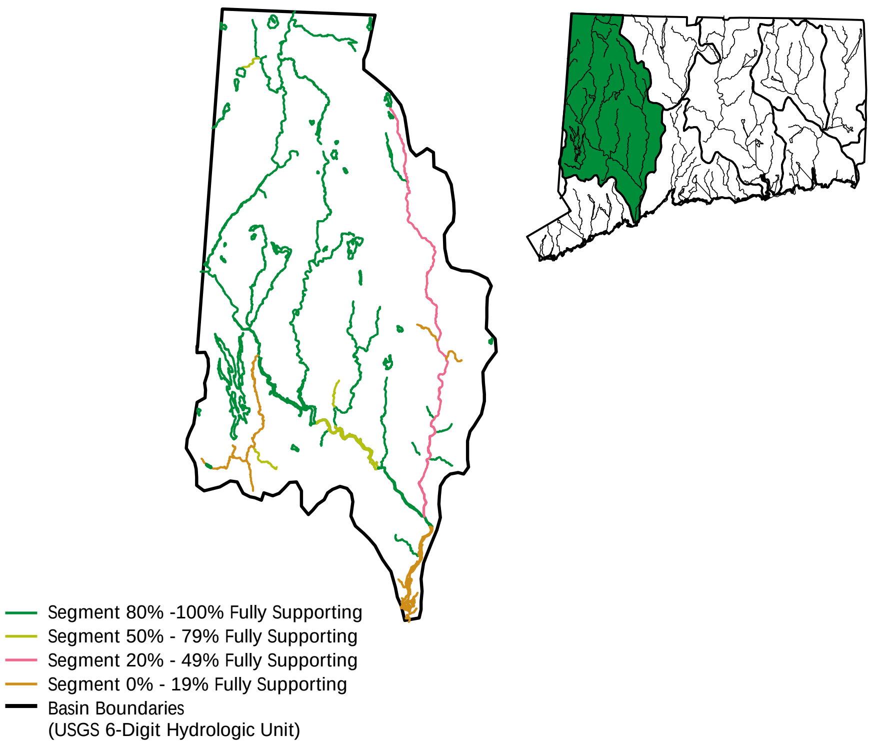
In 1992, Colorado changed its monitoring approach from a statewide network of routine sites and special studies to basin-specific monitoring of one major watershed per year. During the 1996-1997 cycle, the Lower Colorado/Gunnison and Upper Colorado basins were monitored. The basin monitoring program has several long-term objectives such as ensuring there is an adequate database to study changes over time, addressing spatial and temporal variability in water quality, evaluating the impact of point and nonpoint sources on water quality, determining lake trophic status, and developing a database for biological water quality criteria. Colorado plans to devote more resources to monitoring targeted watersheds in the four basins to support the development of TMDLs.



– Not reported in a quantifiable format or unknown.
[a] A subset of Colorado's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.
[c] All of Colorado's rivers marked not attainable for swimming were not necessarily surveyed.

Note: Figures may not add to 100% due to rounding.

Connecticut



This map depicts aquatic life use support status.

For a copy of the Connecticut 1998 305(b) report, contact:

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Surface Water Quality

Connecticut has restored over 300 miles of large rivers since enactment of Connecticut's State Clean Water Act in 1967. Back in 1967, about 663 river miles (or 74% of the state's 893 miles of large rivers and streams) were unfit for fishing and swimming. In 1998, Connecticut reported that 161 river miles (17%) do not fully support aquatic life uses and 220 miles (23%) do not support swimming due to stressors such as bacteria, PCBs, metals, oxygen-demanding wastes, ammonia, nutrients, toxics, and habitat alteration. Sources of these pollutants include urban runoff and storm sewers, industrial dischargers, municipal sewage treatment plants, and in-place contaminants. Threats to Connecticut's reservoir and lake quality include atmospheric deposition, upstream impoundments, and municipal sewage treatment plants.

Hypoxia (low dissolved oxygen) is a widespread problem in Connecticut's estuarine waters in Long Island Sound. Bacteria also prevent shellfish harvesting and an advisory restricts consumption of bluefish and striped bass contaminated with PCBs. Connecticut's estuarine waters are impacted by municipal sewage treatment plants, combined sewer overflows, industrial discharges and runoff, failing septic systems, urban runoff, recreational activities, and atmospheric deposition. Historic waste disposal practices also contaminated sediments in Connecticut's harbors and bays.

Connecticut did not report on the condition of wetlands.

Ground Water Quality

The state and U.S. Geological Survey (USGS) have identified about 1,600 contaminated public and private wells since the Connecticut Department of Environmental Protection (DEP) began keeping records in 1980. Connecticut's Wellhead Protection Program incorporates water supply planning, discharge permitting, water diversion, site remediation, prohibited activities, and numerous nonpoint source controls.

Programs to Restore Water Quality

Ensuring that all citizens can share in the benefits of clean water will require continued permit enforcement, additional advanced wastewater treatment, combined sewer separation, continued aquatic toxicity control, and resolution of nonpoint source issues. To date, 14 sewage treatment facilities have installed advanced treatment to remove nutrients. Nonpoint source management includes education projects and a permitting program for land application of sewage, agricultural sources, and solid waste management facilities.

Wetlands are protected by the state's Clean Water Act and Standards of Water Quality. Each municipality has an Inland Wetlands Agency that regulates filling and establishes regulated buffer areas with DEP training and oversight. Connecticut's courts have strongly upheld enforcement of the wetlands acts and supported regulation of buffer areas to protect wetlands.

Programs to Assess Water Quality

Connecticut samples physical and chemical parameters at 27 fixed stream sites and biological parameters at 47 stream sites. Other activities include intensive biological surveys, toxicity testing, and fish and shellfish tissue sampling for accumulation of toxic chemicals.

– Not reported in a quantifiable format or unknown.

[a] A subset of Connecticut's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

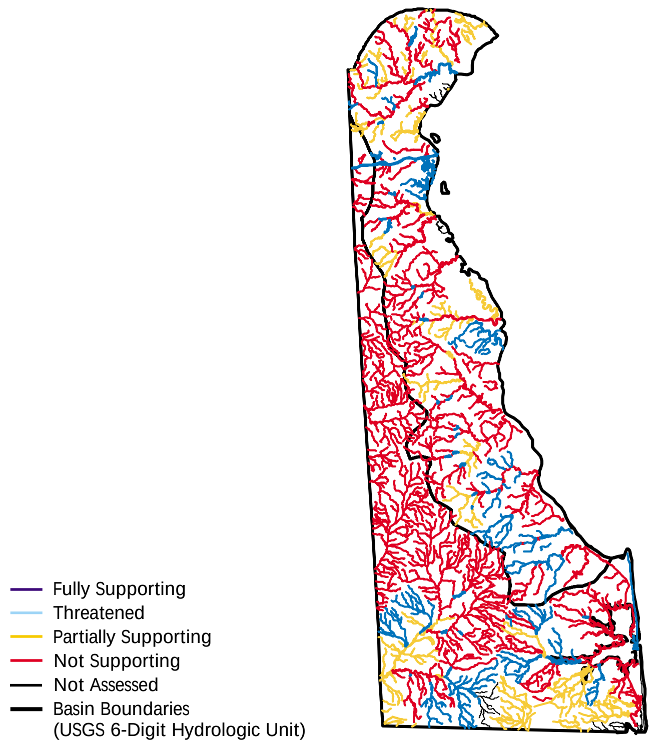
[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Connecticut

Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 5,830)[b]	Total Miles Assessed					
	948	54	29	14	3	<1
	948	85	0	10	5	0
	948	67	9	16	7	<1
Lakes (Total Acres = 64,973)	Total Acres Assessed					
	27,108	88	10	1	0	0
	27,108	88	0	12	0	0
	27,108	64	35	1	0	0
Estuaries (Total Square Miles = 612)	Total Square Miles Assessed					
	612	60	0	30	10	0
	612	100	0	0	0	0
	612	47	0	0	53	0
	612	97	0	1	2	0

Note: Figures may not add to 100% due to rounding.

Delaware



This map depicts aquatic life use support status.

For a copy of the Delaware 1998 305(b) report, contact:

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Delaware Department of Natural Resources and Environmental Control
Division of Water Resources
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Dover, DE 19903
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Surface Water Quality

Delaware's rivers and streams generally meet standards for aquatic life uses, but 98% of the assessed stream miles and 80% of the surveyed lake acres do not meet bacteria criteria for swimming. Bacteria are the most widespread contaminant in Delaware's surface waters, but nutrients and toxics pose the most serious threats to aquatic life and human health. Excessive nutrients stimulate algal blooms and growth of aquatic weeds. Toxics resulted in 14 fish consumption restrictions in three basins, including Red Clay Creek, Red Lion Creek, the St. Jones River, and the Delaware Estuary. Agricultural runoff, urban runoff, municipal sewage treatment plants, and industrial dischargers are the primary sources of nutrients and toxics in Delaware's surface waters.

Delaware did not report on the condition of wetlands.

Ground Water Quality

High-quality ground water provides two-thirds of Delaware's domestic water supply. However, nitrates, synthetic organic chemicals, saltwater, and iron contaminate isolated wells in some areas. In the agricultural areas of Kent and Sussex counties, nitrates in ground water are a potential health concern and a potential source of nutrient contamination in surface waters. Synthetic organic chemicals have entered some ground waters from leaking industrial underground storage tanks, landfills, abandoned hazardous waste sites, chemical spills and leaks, septic systems, and agricultural activities.

Programs to Restore Water Quality

The Department of Natural Resources and Environmental Control (DNREC) adopted a watershed approach to determine the most effective and efficient methods for protecting water quality or abating existing problems. Under the watershed approach, DNREC will evaluate all sources of pollution that may impact a waterway and target the most significant sources for management. DNREC has targeted five basins for development of integrated pollution control strategies: Appoquinimink River, Christina River, Indian River Bay/Rehoboth Bay/Little Assawomen Bay, Murderkill River, and Nanticoke River.

Delaware's Wellhead Protection Program establishes cooperative arrangements with local governments to manage sources of ground water contamination. The state may assist local governments in enacting zoning ordinances, site plan reviews, operating standards, source prohibitions, public education, and ground water monitoring.

Programs to Assess Water Quality

Delaware's Ambient Surface Water Quality Program includes fixed-station monitoring and biological surveys employing rapid bioassessment protocols. Monitoring within the Fixed Station Network is conducted monthly to quarterly for each basin in Delaware. Delaware is developing and testing new protocols for sampling biological data in order to determine whether specific biological criteria can be developed to determine support of designated uses.

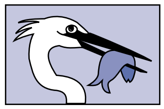
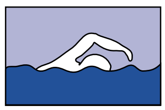
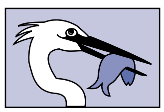
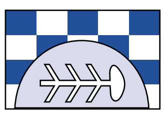
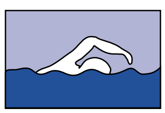
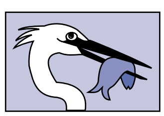
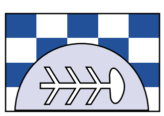
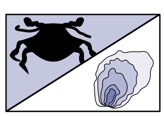
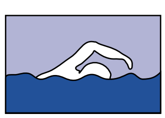
– Not reported in a quantifiable format or unknown.

[a] A subset of Delaware's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

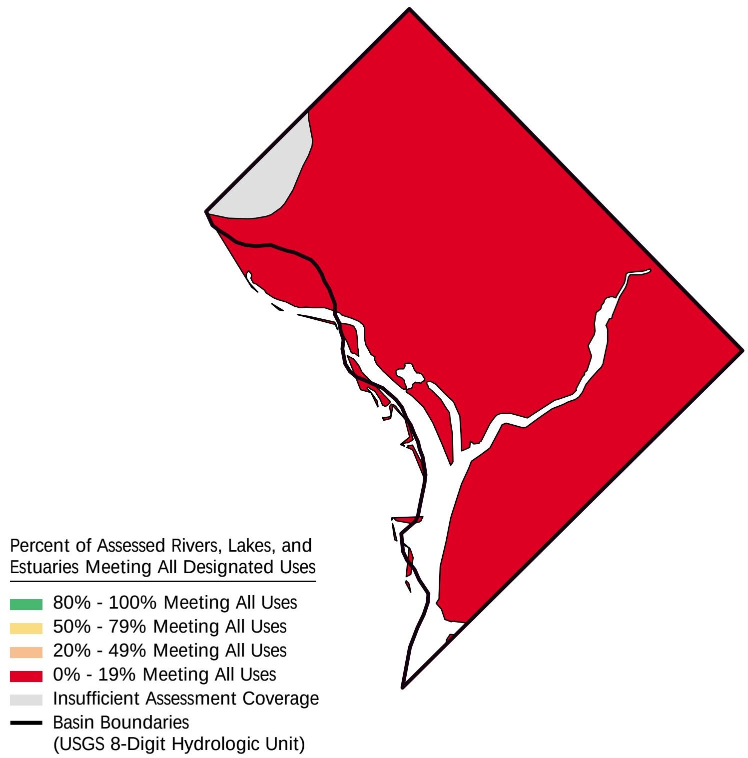
[c] Does not include waters under jurisdiction of the Delaware River Basin Commission.

Individual Use Support in Delaware

Designated Use[a]	Total Assessed	Good (Fully Supporting) (Percent)	Good (Threatened) (Percent)	Fair (Partially Supporting) (Percent)	Poor (Not Supporting) (Percent)	Not Attainable (Percent)
Rivers and Streams (Total Miles = 2,509)[b]						
	Total Miles Assessed: 2,510	17	-	20	63	-
	-	-	-	-	-	-
	2,005	2	-	22	75	-
Lakes (Total Acres = 2,954)						
	Total Acres Assessed: 2,954	70	-	16	14	-
	-	-	-	-	-	-
	2,954	20	-	40	40	-
Estuaries (Total Square Miles = 812)[c]						
	Total Square Miles Assessed: 29	0	-	0	100	-
	-	-	-	-	-	-
	30	2	-	98	0	-
	30	41	-	44	15	-

Note: Figures may not add to 100% due to rounding.

District of Columbia



For a copy of the District of Columbia 1998 305(b) report, contact:

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Water Quality Division
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2100 Martin Luther King Jr. Avenue, SE
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(202) 645-6601

Surface Water Quality

Water quality in the District of Columbia continues to be impaired. Each of the waterbodies monitored was impaired for one or more of its designated uses. The uses that relate directly to human use of the waterbodies were generally not supported, while those uses that directly affected the quality of habitat for aquatic life were at least partially supported. For example, the Anacostia River remains aesthetically and chemically polluted. However, the pollution is at a level that supports fish and other wildlife. Submerged aquatic vegetation (SAV) is found in the Anacostia and Potomac Rivers, with the Potomac supporting a diverse groups of SAV species. The Potomac River continues to benefit from improvements at the city's wastewater treatment plant and combined sewer overflow system improvements.

Major causes of impairment common to the District's waterbodies are organic enrichment and pathogens. The sources of impairment with major impacts are combined sewer overflows, urban runoff/storm sewers, and municipal point sources. These sources are associated with the land uses common in an urban area.

The District of Columbia did not report on the condition of wetlands.

Ground Water Quality

The drinking water source for the District of Columbia is surface water. The intake is located in the Potomac River north of the city's boundary. Consequently, ground water is not monitored on a regular, intensive basis. However, compliance monitoring data are scrutinized for ground water related information whenever it is available.

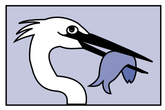
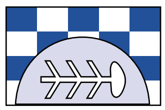
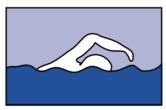
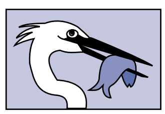
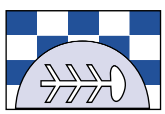
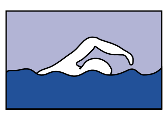
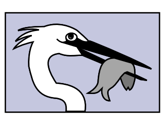
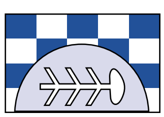
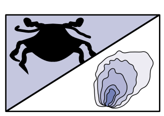
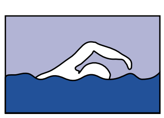
Programs to Restore Water Quality

The District's water quality programs are involved in the process of identifying and evaluating CSO control methods; the initiation of the TMDL process; the identification and support of projects to control stormwater runoff; and cleanups of trash and debris. Efforts to restore the ground water quality include underground storage tanks, pesticide certification, and enforcement programs.

Programs to Assess Water Quality

The District performs monthly physical and chemical sampling at 56 fixed stations on the Potomac and Anacostia rivers and their tributaries. At each water chemistry station, four samples a year are collected for heavy metals analysis. Biological monitoring is also implemented in the District's tributaries. Twenty-seven sites are sampled at least once every 2 years for biological, fish, morphological, and water quality parameters.

Individual Use Support in the District of Columbia

Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 39)[b]	Total Miles Assessed					
	38.4	0	0	44	56	-
	24.3	0	0		100	-
	27.7	0	0		100	-
Lakes (Total Acres = 238)	Total Acres Assessed					
	238	57	0	0	43	0
	238	0	0	0	100	0
	238	0	0	0	100	0
Estuaries (Total Square Miles = 6)	Total Square Miles Assessed					
	6	58	0	42	0	-
	6	0	0	0	100	-
	-	-	-	-	-	-
	6	0	0	0	100	-

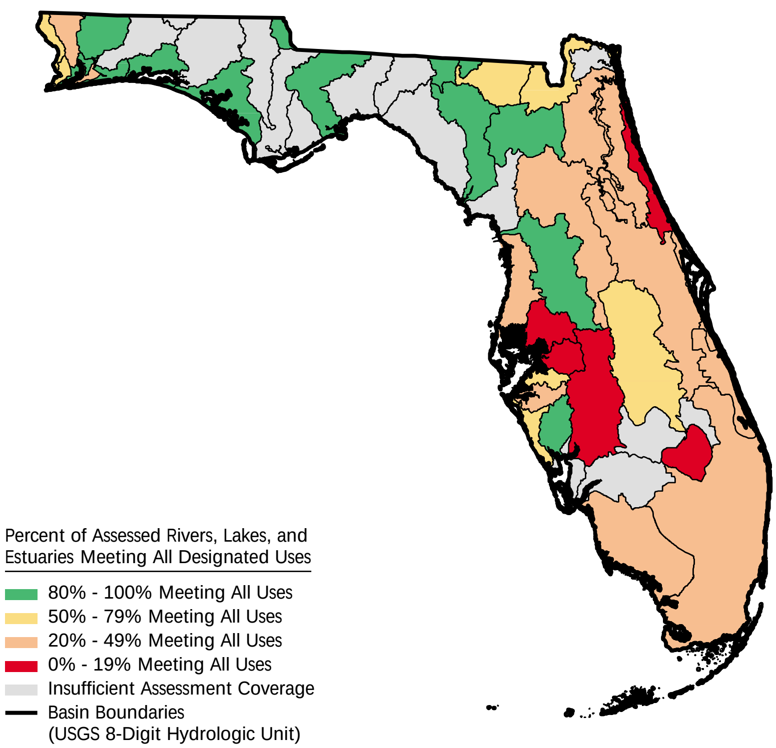
Note: Figures may not add to 100% due to rounding.

– Not reported in a quantifiable format or unknown.

[a] A subset of District of Columbia's designated uses appear in this figure. Refer to the District's 305(b) report for a full description of the District's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Florida



For a copy of the Florida 1998 305(b) report, contact:

Joe Hand
Florida Department of Environmental Protection
Mail Station 3565
2600 Blair Stone Road
Tallahassee, FL 32399-2400
(850) 921-9441
e-mail: joe.hand@dep.state.fl.us

Surface Water Quality

The overall majority of Florida's surface waters are of good quality, but problems exist around densely populated urban areas, primarily in central and southern Florida. In rivers, nutrient enrichment, low dissolved oxygen/organic enrichment, siltation, and pathogens are the leading causes of degraded water quality. In lakes, the leading problems result from nutrients and algae. In estuaries, nutrient enrichment, metals, and algae degrade quality. Urban stormwater, agricultural runoff, industrial and municipal point sources, and construction are the major sources of water pollution in Florida.

The state recognizes the integrity of the following ecosystems as special state concerns: Everglades system, Florida Bay, Florida Keys, and Apalachicola River and Bay. Other issues of special concern are widespread mercury contamination in both marine and freshwater fish, protection of coastal areas and estuaries because of their ecological importance and significant contribution to Florida's economy, and integration of water quantity and quality decisions.

Ground Water Quality

Data from over 2,900 monitoring wells and 1,300 private water supply wells in Florida's ambient monitoring network indicate generally good water quality, but local ground water contamination problems exist. Agricultural chemicals, including aldicarb, alachlor, bromacil, simazine, and ethylene dibromide (EDB) have caused local and, in the case of EDB, regional problems. Other threats include petroleum products from leaking underground storage tanks, nitrates from dairy and other livestock operations, fertilizers and pesticides in stormwater runoff, toxic chemicals in leachate from hazardous waste sites, dry cleaner operations, and landfills. The state requires periodic testing of all community water systems for 118 toxic organic chemicals.

Programs to Restore Water Quality

Florida's point source permitting process was modified in 1995 with the delegation of the National Pollutant Discharge Elimination System (NPDES) program to Florida, but does not include stormwater permitting. The state wastewater program issues permits for facilities that discharge to either surface or ground water. The state permit for surface water dischargers now serves as the NPDES permit. Florida permits about 4,794 ground water and surface water discharge facilities. The state also encourages reuse of treated wastewater (primarily for irrigation) and the use of constructed and natural wetlands for treatment of wastewater as alternatives to direct discharge.

Florida has established several programs focused on the restoration or preservation of state waters. The 1987 Surface Water Improvement and Management Act requires management and restoration plans for preserving or restoring priority waterbodies and setting of Pollutant Load Reduction Goals (PLRGs) for those waterbodies. The 1999 Florida Legislature enacted the Florida Watershed Restoration Act to provide a process for restoring waters through the establishment and implementation of TMDLs for pollutants of impaired waters. The state has also purchased environmentally sensitive lands for protection since 1963.

Programs to Assess Water Quality

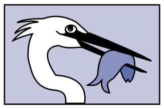
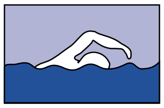
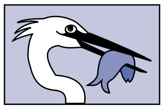
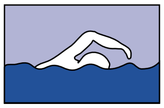
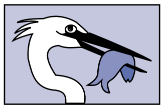
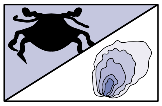
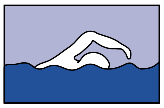
Florida's Surface Water Ambient Monitoring Program was integrated with the Ground Water Ambient Monitoring Program in 1996, while SWAMP's biocriteria and bioassessment work was moved to a separate section. Florida has adopted a tiered Integrated Water Resources Monitoring Network, which includes sampling of both surface and ground waters, to assess state waters. Tier 1 answers questions on a statewide or regional scale. Tier II addresses basin-specific or waterbody-specific questions. Tier III includes monitoring associated with regulatory permits and evaluations of TMDLs and BMPs.

Florida is developing assessment methods and criteria for wetlands.

[a] A subset of Florida's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

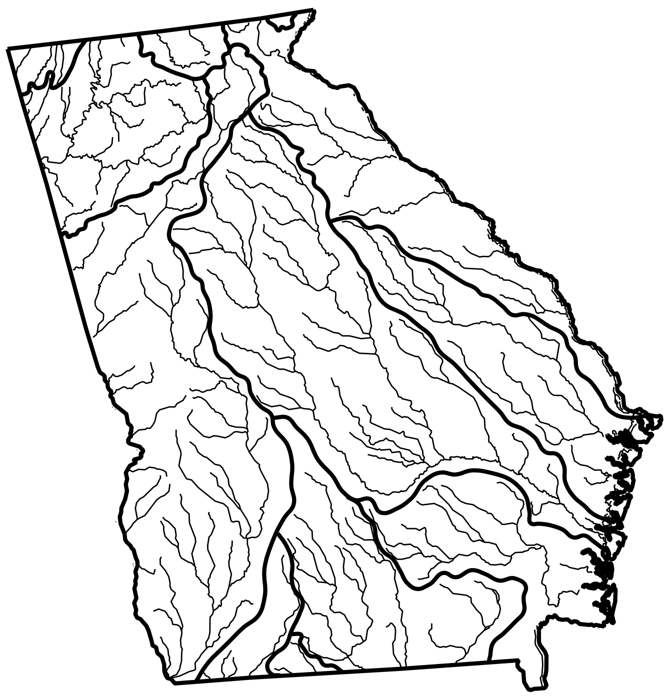
[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Florida

Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 51,858)[b]	Total Miles Assessed					
	4,947	53	4	37	7	-
	772	0	0	80	20	-
	4,947	53	4	37	7	-
Lakes (Total Acres = 2,085,120)	Total Acres Assessed					
	642,432	46	7	35	12	-
	69,504	0	0	100	0	-
	642,504	46	7	36	12	-
Estuaries (Total Square Miles = 4,298)	Total Square Miles Assessed					
	601	45	0	45	10	-
	319	0	0	100	0	-
	818	74	0	26	0	-
	601	45	0	45	10	-

Note: Figures may not add to 100% due to rounding.

Georgia



For a copy of the Georgia 1998 305(b) report, contact:

W.M. Winn, III
Georgia Environmental Protection Division
Watershed Planning and Monitoring Program
4220 International Parkway – Suite 101
Atlanta, GA 30354
(404) 675-6236

Surface Water Quality

The Georgia Environmental Protection Division (GAEPD) reported that, of the river miles assessed, 55% fully support aquatic life use, 30% partially support this use, and 16% do not support aquatic life use. Major causes of impairment for rivers include metals, pathogens, and low dissolved oxygen levels. For lakes, 73% of the assessed acres fully support aquatic life use, 25% partially support the use, and 2% do not support aquatic life use. The major causes of impairment for lakes are metals, acidity, and pathogens. For both rivers and lakes, the major sources of impairment include urban runoff and storm sewers, industrial nonpoint sources, and other nonpoint sources.

Of Georgia's estuarine waters, 88% of the assessed square miles fully support aquatic life use, 12% partially support the use, and less than 1% do not support aquatic life use. Fifty-four percent of the assessed shellfishing area fully supports shellfishing use while 46% does not support this use. Pathogens and low dissolved oxygen levels were the major causes of impairment. Urban runoff and storm sewers, along with other nonpoint sources, are the major sources of impairment to Georgia's estuarine waters.

Georgia did not report on the condition of wetlands.

Ground Water Quality

Georgia's ambient Ground Water Monitoring Network consists of approximately 185 wells sampled periodically. To date, increasing nitrate concentrations in the Coastal Plain are the only adverse trend detected by the monitoring network, but nitrate concentrations are still well below harmful levels in most wells. Additional nitrate sampling in over 5,000 wells since 1991 revealed that nitrate concentrations exceeded EPA's maximum contaminant level in less than 1% of the tested wells. Pesticide monitoring indicates that pesticides do not threaten Georgia's drinking water aquifers at this time.

Programs to Restore Water Quality

During the 1996-1997 reporting cycle, river basin management planning was a priority for the GAEPD. The state completed work on the final draft basin plans for the Chattahoochee and Flint Rivers in 1997, and the plans were adopted in 1998. GAEPD is also working with EPA on a Savannah River Watershed Project and with the Florida Department of Environmental Protection and the Suwannee River Water Management District in Florida to implement basin planning for the Suwannee River basin.

In addition to basin planning, the state also placed emphasis during 1996-1997 on NPDES permitting and enforcement, nonpoint source pollution abatement, monitoring and assessment, Chattahoochee River modeling, fish consumption guidance, stormwater permitting, treatment plant funding, and public participation projects.

Programs to Assess Water Quality

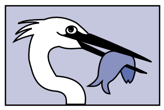
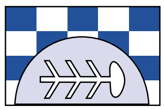
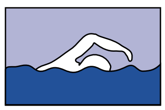
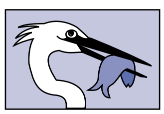
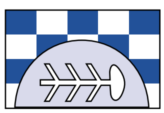
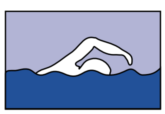
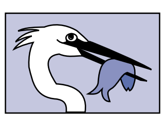
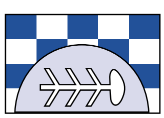
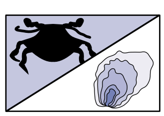
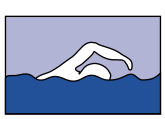
The GAEPD conducts long-term ambient trend monitoring through a fixed station network, toxicity studies, intensive surveys, fish tissue monitoring, lake water quality studies, facility compliance sampling, aquatic toxicity testing at NPDES discharges. In the assessment process, GAEPD also draws upon biotic data from the state's Department of Natural Resources (DNR). The DNR uses the Index of Biotic Integrity (IBI) to identify impacted fish populations.

– Not reported in a quantifiable format or unknown.

[a] A subset of Georgia's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Georgia

Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 70,150)[b]	Total Miles Assessed					
	6,186	55	-	30	16	-
	-	-	-	-	-	-
	5,351	63	-	18	19	-
Lakes (Total Acres = 425,382)	Total Acres Assessed					
	399,300	73	-	25	2	-
	361,416	10	-	74	15	-
	399,295	95	-	5	0	-
Estuaries (Total Square Miles = 854)	Total Square Miles Assessed					
	854	88	-	12	<1	-
	854	98	-	0	2	-
	850	54	-	0	46	-
	854	100	-	<1	0	-

Note: Figures may not add to 100% due to rounding.

Guam

— Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Guam 1998 305(b) report, contact:

Mike Gawel
Guam Environmental Protection Agency
Planning and Environmental Review Division
P.O. Box 22439 GMF
Barrigada, GU 96921
(671) 475-1662

Surface Water Quality

Guam is free from pollution of neighboring land masses due to its remote location adjacent to the deepest ocean depths. Its shores are washed by tropical ocean currents, and air is freshened by unpolluted trade winds. Therefore, water pollution on Guam is locally generated and quickly dissipated into the vast Western Pacific Ocean. Guam's single lake has been a continuous safe source of drinking water to the U.S. Navy and some of the public. Coastal recreation waters tested weekly at 35 beach sites in 1997 showed violation of bacterial samples in 187 out of 1,647 samples. Since 1991, only one Guam beach has been closed to the public because of toxicity of algae consumed from that site. Main sources of pollution problems are siltation, sedimentation, and turbidity due to stormwater-caused erosion and treated sewage discharges, all of which impact valuable coral reefs.

Guam did not report on the condition of wetlands.

Ground Water Quality

The Northern Guam Lens is an aquifer under the northern half of the island fed by rainwater that has percolated through porous limestone and floats on top of denser seawater. It was designated a principal source aquifer by EPA in 1978 and is the major source of water for the over 150,000 inhabitants and over 1 million annual visitors to Guam. Guam Waterworks Authority pumps approximately 27 million gallons per day of this high-quality ground water for public supply in addition to smaller levels produced privately and by the U.S. Navy and Air Force. From 1995 to 1997, 5 of the over 125 production wells were closed because of contamination by TCE, PCE, and EDB. A few wells have shown chloride increases in recent years.

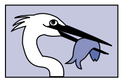
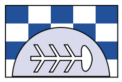
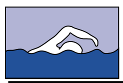
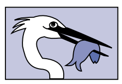
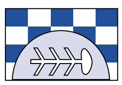
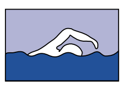
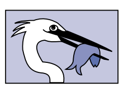
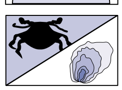
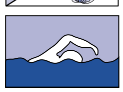
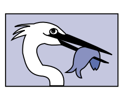
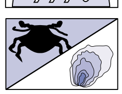
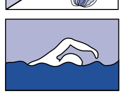
Programs to Restore Water Quality

The Guam Environmental Protection Agency (GEPS) regularly revises the Guam Water Quality Standards. It administers permits for sewer connections, individual waste water systems, clearing and grading (for erosion control), well drilling, wetland use, 401 Water Quality Certification, and feedlot waste management, while supporting NPDES permit administration and coordinating with others in applying the Federal Consistency, land use, and seashore use permits. GEPA policies require each development to contain 20-year stormwaters within its lot, for nonpoint control and recharge of ground waters, and to limit density of unsewered dwellings. Guam's new Land Use Plan applies performance standards to protect water quality. Filtration systems have been installed for removal of the contaminants found at four production wells, while investigations continue on the sources of contamination.

Programs to Assess Water Quality

GEPA's Surface Water Monitoring System, in place over 20 years, was redesigned with emphasis on watershed management in 1997. It assesses quality of high public use waters including 52% of all rivers and representative reef, estuary, and marine waters as well as all major public beach areas. Updated microbiological methods were established in 1996 and a marine biological monitoring program is being pursued to correlate with physical and chemical monitoring. The GEPA laboratory increased capabilities to test water in 1997 and will institute electronic reporting for the 305(b) Program in 1999. The Guam Hydrologic Survey, which produces and manages water data, was established by law in 1998.

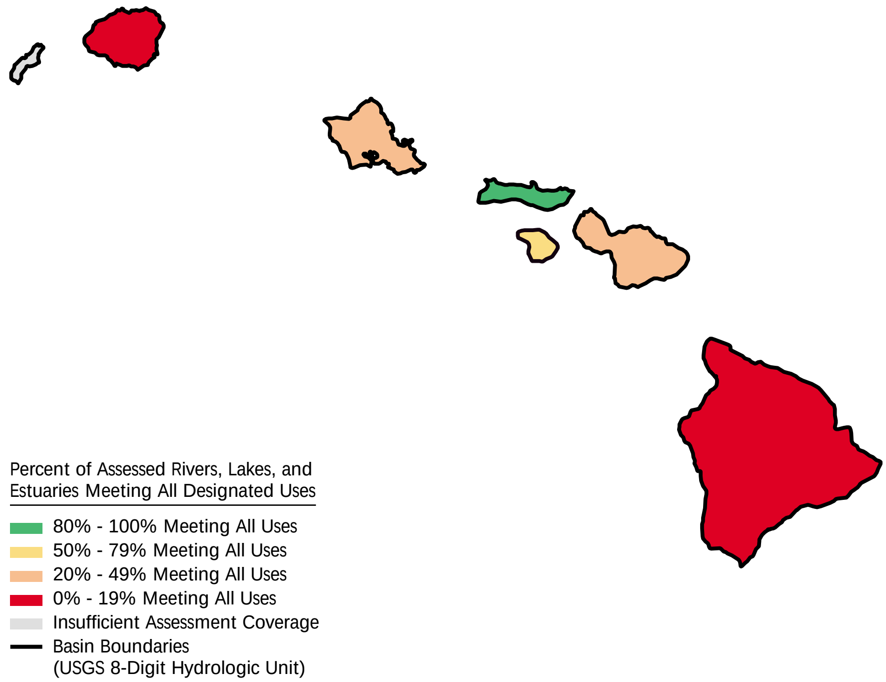
Individual Use Support in Guam

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 228)[a]	Total Miles Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Lakes (Total Acres = 27)	Total Acres Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Estuaries (Total Square Miles = 1,530)	Total Square Miles Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Ocean Shoreline (Total Shore Miles = 117)	Total Miles Assessed					
	-					
	-					
	-					
	13.6	0	3	20	77	0

– Not reported in a quantifiable format or unknown.
[a] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Hawaii



For a copy of the Hawaii 1998 305(b) report, contact:

Eugene Akazawa, Monitoring Supervisor
Hawaii Department of Health
Clean Water Branch
919 Ala Moana Blvd., Room 301
Honolulu, HI 96814
(808) 586-4309

Surface Water Quality

Most of Hawaii's waterbodies have variable water quality due to stormwater runoff. During dry weather, most streams and estuaries have good water quality that fully supports beneficial uses, but the quality declines when stormwater runoff carries pollutants into surface waters. The most significant pollution problems in Hawaii are siltation, turbidity, nutrients, organic enrichment, toxics, pathogens, and pH from nonpoint sources, including agriculture and urban runoff. Introduced species and stream alteration are other stressors of concern. Very few point sources discharge into Hawaii's streams; most industrial facilities and wastewater treatment plants discharge into coastal waters. Other concerns include elevated levels of arsenic from a now-closed canoe plant and the spread, through recreational contact, of *leptospirosis*, a disease caused by a pathogenic bacteria.

Hawaii did not report on the condition of wetlands.

Ground Water Quality

Compared to mainland states, Hawaii has very few ground water problems due to a long history of land use controls for ground water protection. Prior to 1961, the state designated watershed reserves to protect the purity of rainfall recharging ground water. The Underground Injection Control Program also prohibits wastewater injection in areas surrounded by "no-pass" lines. However, aquifers outside of reserves and no-pass lines may be impacted by injection wells, household wastewater disposal systems, such as seepage pits and cesspools, landfills, leaking underground storage tanks, and agricultural activities.

Programs to Restore Water Quality

Recognition of nonpoint source pollution as the major cause of surface water impairment in Hawaii has led to the creation of the

Polluted Runoff Control (PRC) Program. The PRC administers the Nonpoint Source Pollution Control Program, which has oversight for nonpoint source implementation projects. In addition, the program with the largest impact on nonpoint source pollution is the stormwater program. This is a permitting program administered by the Clean Water Branch of the Department of Health for entities that discharge significant quantities of stormwater.

Programs to Assess Water Quality

Hawaii's monitoring program, which is based on a network of routine monitoring stations, has continued to suffer setbacks due to budgetary restraints over the past several years. Toxics and biota sampling were completely curtailed and routine monitoring has been reduced significantly. The Department of Health (DOH) is investigating the use of *Clostrida Pererfringens* as an indicator of sewage contamination, and some new laboratory equipment has been purchased. Other than these two developments, DOH has not initiated any new monitoring or assessment programs or made significant innovations to the existing ones. Unfortunately, further budgetary cuts are expected in the future.

– Not reported in a quantifiable format or unknown.

[a] A subset of Hawaii's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Hawaii

Percent

Rivers and Streams (Total Miles = 3,905)[b]

Designated Use[a]	Total Miles Assessed	Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
	3,905	40	0	0	60	0
	3,892	100	0	0	0	0
	3,898	100	0	0	0	0

Lakes (Total Acres = 2,168)

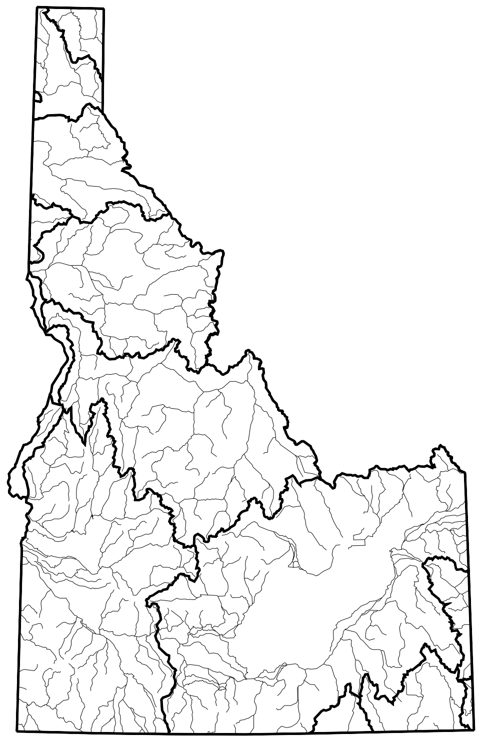
Designated Use[a]	Total Acres Assessed	Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

Estuaries (Total Square Miles = 55)

Designated Use[a]	Total Square Miles Assessed	Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
	0.02	100	0	0	0	0
	0.02	0	0	0	100	0
	0.02	0	0	0	100	0
	0.02	0	0	0	100	0

Note: Figures may not add to 100% due to rounding.

Idaho



For a copy of the Idaho 1998 305(b) report, contact:

Michael McIntyre
Idaho Department of Health
and Welfare
Division of Environmental Quality
1410 North Hilton
Statehouse Mall
Boise, ID 83720
(208) 373-0502
e-mail: mmintyr@deq.state.id.us

Surface Water Quality

Idaho reports that 33% of river and stream miles fully support uses, while 67% are impaired for one or more uses. Based on the state's proposed Section 303(d) list, the major causes of impairment in Idaho's rivers and streams include siltation, nutrients, thermal modifications, bacteria, habitat alterations, and oxygen-depleting substances. The state has not yet determined the sources of impairment to rivers and streams.

Information on lake use support was not included in Idaho's 1998 305(b) report because the state is currently developing a lake and reservoir beneficial use assessment process. Based on the state's proposed Section 303(d) list, the major causes of impairment in Idaho's lakes and reservoirs include oxygen-depleting substances, nutrients, acidity, toxic chemicals, mercury, and flow alterations.

Idaho did not report on the condition of wetlands.

Ground Water Quality

More than 90% of Idaho's residents use ground water as their domestic water supply. The major sources of ground water contamination in Idaho are agricultural activities, waste storage and disposal, mining, and hazardous material transportation.

Ground water quality data in Idaho come primarily from the Statewide Ambient Ground Water Quality Monitoring Network and the Public Water Systems. On a statewide basis, the ground water contaminants of greatest concern are nitrates, pesticides, and volatile organic compounds.

Programs to Restore Water Quality

EPA has primary responsibility for issuing NPDES permits in Idaho. The Idaho Division of Environmental Quality (DEQ) is concerned that EPA does not have the staff to issue new permits or revise and reissue old permits. Major discharges are inspected annually but minor discharges do not receive this attention.

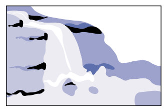
The nonpoint source program in Idaho is administered on a watershed basis and includes provisions for public education and technical protocol development. Project emphasis is placed on management effectiveness, beneficial use monitoring, public awareness, antidegradation, and endangered species issues.

Programs to Assess Water Quality

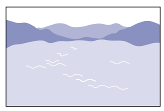
Monitoring activities in Idaho have focused on beneficial uses and ambient water quality trends. Data from DEQ's monitoring are used to document the existence of uses, the degree of use support, and reference conditions. This monitoring is made up of primarily the collection of biological and physical data. The ambient trend monitoring network is designed to document water quality trends at the river basin and watershed scales through the collection of mainly water column constituent data. Biological parameters are being added to this network as well. Fifty-six monitoring stations are currently sampled on a rotating basis to provide data for water quality trend assessment.

Summary of Use Support[a] in Idaho

Rivers and Streams (Total Miles = 115,595)[b]



Lakes (Total Acres = 700,000)



		Percent		
		Good (Fully Supporting)	Good (Threatened)	Impaired (For One or More Uses)
Rivers and Streams	Total Miles Assessed: 12,280	28	5	67
Lakes	Total Acres Assessed: -	-	-	-

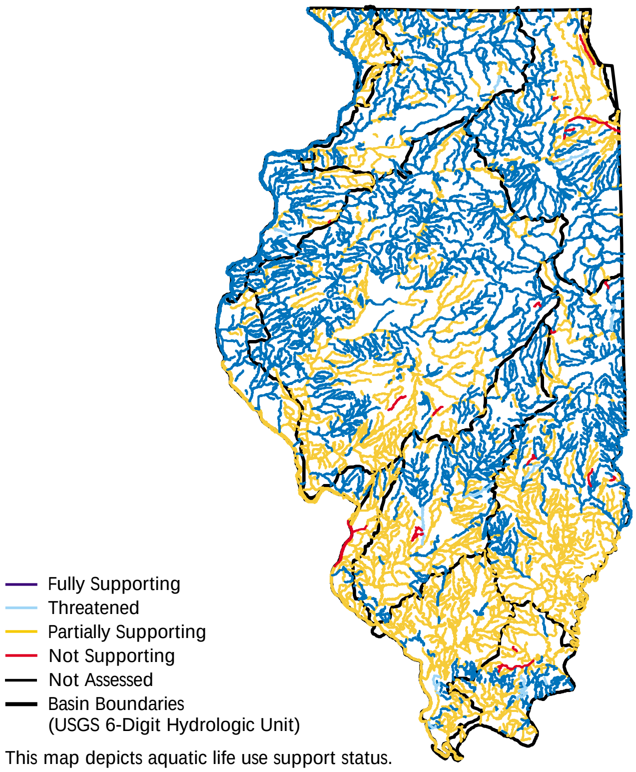
– Not reported in a quantifiable format or unknown.

[a] A summary of use support data is presented because Idaho did not report individual use support in their 1998 Section 305(b) report.

[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Illinois



This map depicts aquatic life use support status.

For a copy of the Illinois 1998 305(b) report, contact:

Mike Branham
Illinois Environmental Protection Agency
Division of Water Pollution Control
P.O. Box 19276
Springfield, IL 62794-9276
(217) 782-3362
e-mail: epa1110@epa.state.il.us

For more information, visit IEPA on the Internet at: *http://www.epa.state.il.us/water/water-quality*

Surface Water Quality

The Illinois Environmental Protection Agency (IEPA) reported that over 55% of assessed stream miles fully support aquatic life use, which the state considers the single best indicator of overall stream conditions. The major causes of impairment in Illinois' rivers include nutrients, siltation, habitat/flow alteration, organic enrichment/dissolved oxygen depletion, metals, and suspended solids. Major sources include agriculture, point sources, hydrological/habitat modification, urban runoff, and resource extraction.

Fifty-two percent of Illinois' inland lake acres fully support aquatic life uses, while another 46% partially support this use, and 3% do not support aquatic life use. The major causes of impairment to Illinois' inland lakes include nutrients, siltation, suspended solids, and organic enrichment/dissolved oxygen depletion. Major sources include agriculture, contaminated sediments (in-place contaminants such as sediment, or phosphorus attached to particles), and hydrological/habitat modification.

Water quality continues to improve in the Illinois portion of Lake Michigan. Trophic status has improved from mesotrophic/eutrophic conditions in the 1970s to oligotrophic conditions today.

Illinois did not report on the condition of wetlands.

Ground Water Quality

Ground water quality is generally good, but past and present activities contaminate ground water in isolated areas. Major sources of ground water contamination include agricultural chemical operations, fertilizer and pesticide applications, above- and belowground storage tanks, septic systems, manufacturing/repair shops, surface impoundments, and wastepiles.

Programs to Restore Water Quality

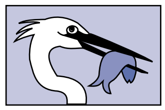
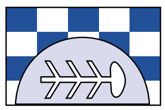
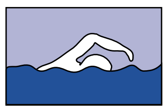
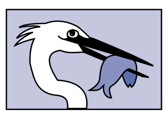
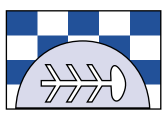
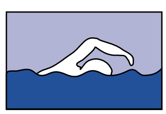
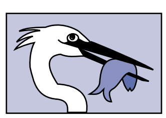
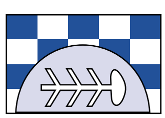
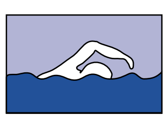
The IEPA recently directed program resources toward a watershed-based framework to effectively protect and restore natural resources. This comprehensive approach will focus on the total spectrum of water resource issues, emphasizing involvement of citizens and the regulated community. The IEPA has restructured its program activities using a priority watershed management approach.

Illinois established a Great Lakes Program Office in FY93 to oversee all Lake Michigan programs on a multimedia basis. Activities include promotion of pollution prevention for all sources of toxics in all media (such as air and water).

Programs to Assess Water Quality

The IEPA has maintained a comprehensive surface water monitoring and assessment program since its inception in 1970. Monitoring activities focus on water and sediment chemistry as well as on physiological and biological data (e.g., aquatic invertebrates, fisheries, and habitat). Data from more than 4,000 stations have been used in the assessment of surface water quality conditions. In addition, over 600 volunteers participate in citizen monitoring of over 300 lakes as part of IEPA's Volunteer Lake Monitoring Program, which has been incorporated into the state's water quality assessments.

Individual Use Support in Illinois

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 87,110)[b]	Total Miles Assessed					
	28,448	55	1	43	1	-
	3,779	81	0	0	19	-
	3,502	23	0	22	55	-
Lakes (Total Acres = 309,340)	Total Acres Assessed					
	188,103	42	10	46	3	-
	127,814	77	0	14	9	-
	188,277	9	12	47	32	-
Great Lakes (Total Shore Miles = 63)	Total Shore Miles Assessed					
	63	0	100	0	0	0
	63	0	0	0	100	0
	63	79	0	21	0	0

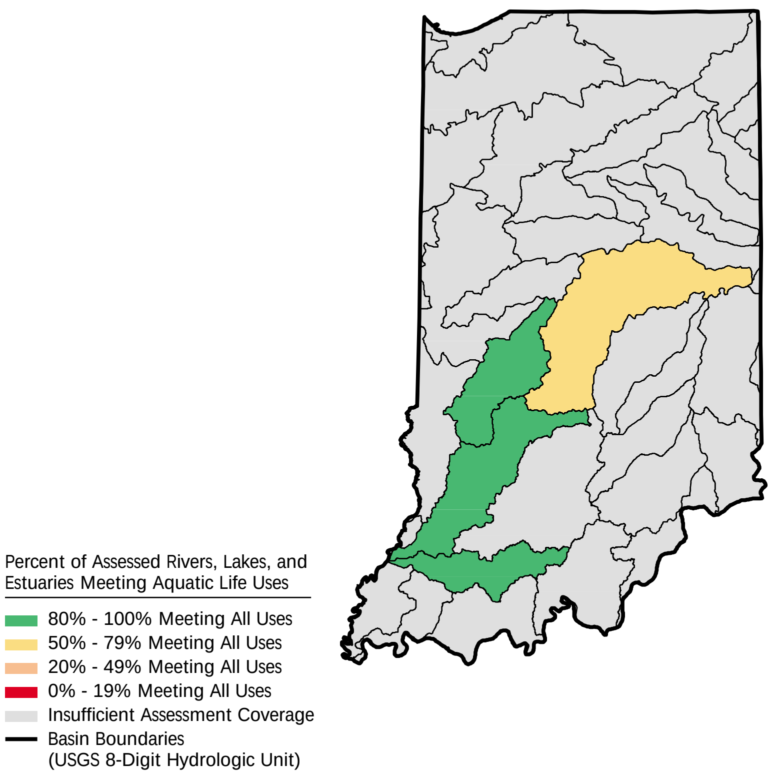
Note: Figures may not add to 100% due to rounding.

– Not reported in a quantifiable format or unknown.

[a] A subset of Illinois' designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Indiana



For a copy of the Indiana 1998 305(b) report, contact:

Linda Schmidt
Indiana Department of Environmental Management
Office of Water Management
P.O. Box 6015
Indianapolis, IN 46206-6015
(317) 233-8905
e-mail: lschmidt@dem.state.in.us

The report is also available on the Internet at: *http://www.state.in.us/idem/owm/index.html*

Surface Water Quality

All of the surveyed lake acres and 79% of the surveyed river miles have good water quality that fully supports aquatic life. However, 21% of the surveyed river miles do not support swimming due to high bacteria concentrations. A fish consumption advisory impairs all of Indiana's Lake Michigan shoreline. The pollutants most frequently identified in Indiana waters include PCBs, bacteria, priority organic compounds, oxygen-depleting wastes, pesticides, and metals. The sources of these pollutants include combined sewer overflows, resource extraction, and land disposal. Many sources are unknown.

Indiana identified elevated concentrations of toxic substances in about 5% of the river miles monitored for toxics. High concentrations of PCBs and mercury were most common in sediment samples and in fish tissue samples.

Ground Water Quality

Indiana has a plentiful ground water resource serving nearly 70% of its population for drinking water and filling many of the water needs of business, industry, and agriculture. The major sources of ground water contamination in Indiana are commercial fertilizer application, confined animal feeding operations, underground storage tanks, surface impoundments, landfills constructed prior to 1989, septic systems, shallow injection wells, industrial facilities, materials spills, and salt storage and road salting. Contaminants from these sources include nitrate, salts, pesticides, petroleum compounds, metals, radionuclides, and bacteria. Ground water protection programs are being implemented through the efforts of five state agencies.

Programs to Restore Water Quality

In February 1997, the Indiana Water Pollution Control Board adopted revised water quality standards for those waters in the Great Lakes Basin. Water quality standards, including proposed sediment and wetland narrative criteria, for the area outside the Great Lakes Basin are currently under development. Macroinvertebrate and fish community data are being evaluated for the purpose of developing biocriteria.

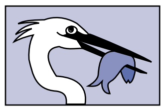
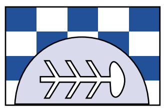
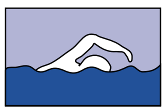
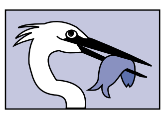
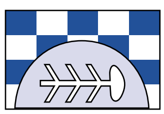
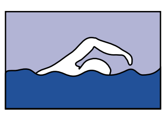
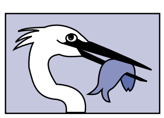
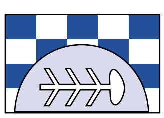
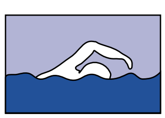
Point sources are regulated primarily through the NPDES program in Indiana. The state has a goal of processing over 400 administratively extended permits by June 1999. Nonpoint sources are addressed through watershed management and planning projects. In 1996 and 1997, federal funds totaling $4,450,000 were used to support nonpoint source control projects in Indiana.

Programs to Assess Water Quality

A new surface water monitoring strategy for Indiana was implemented in 1996 with the goal of monitoring all waters of the states by 2001 and reporting the assessments by 2003. Each year approximately 20% of the waterbodies in the state will be assessed and reported the following year. Assessment in 1997 and reporting in 1998 focused on the White River, West Fork, and Patoka River basins. Elements of Indiana's sampling program include: fixed station monitoring, TMDL development, trace metals monitoring, pesticide water column monitoring, bacteriological sampling, and targeted fish tissue and surficial aquatic sediment sites. The program also includes a number of sites selected by probabilistic design and sampled for fish community biotic integrity, benthic aquatic macroinvertebrate community biotic integrity, fish tissue contaminants, surficial aquatic sediment contaminants, and water column chemistry.

Indiana is developing biological assessment methods and criteria for wetlands.

Individual Use Support in Indiana

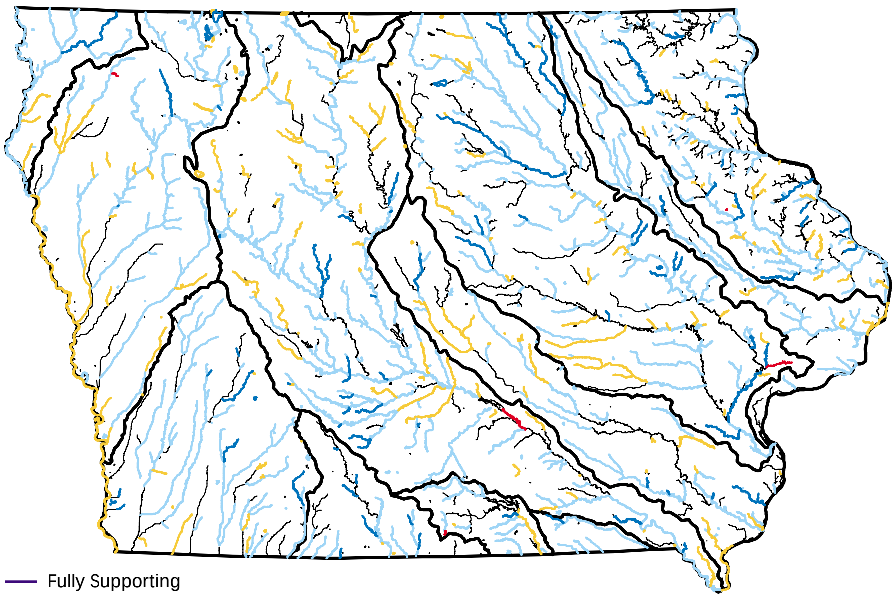
Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 35,673)[b]	Total Miles Assessed					
	7,339	73	6	10	11	0
	3,029	0	0	84	16	0
	4,076	77	1	4	17	0
Lakes (Total Acres = 142,871)	Total Acres Assessed					
	13,455	50	50	0	0	0
	45,135	0	0	96	4	0
	-	-	-	-	-	-
Great Lakes (Total Shore Miles = 43)	Total Shore Miles Assessed					
	43	100	0	0	0	0
	43	0	0	100	0	0
	43	0	0	100	0	0

[a] A subset of Indiana's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Iowa



Fully Supporting
Threatened
Partially Supporting
Not Supporting
Not Assessed
Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

This map depicts aquatic life use support status.

For a copy of the Iowa 1998 305(b) report, contact:

John Olson
Iowa Department of Natural Resources
Water Resources Section
502 East 9th Street
Des Moines, IA 50319
(515) 281-8905
e-mail: John.Olson@dnr.state.ia.us

Surface Water Quality

There is impaired aquatic life use in 19% of Iowa's assessed rivers and 35% of assessed lakes. Swimming use is impaired in 54% of 913 surveyed river miles and 26% of assessed lakes, ponds and reservoirs. Saylorville, Red Rock, Coralville, and Rathbun reservoirs have good water quality that fully supports all designated uses. However, siltation threatens beneficial uses at all reservoirs, and agricultural pesticides threaten drinking water uses at Rathbun. Point sources still pollute about 5% of the assessed stream miles and two lakes.

Ground Water Quality

Ground water supplies about 80% of Iowa's drinking water. Agricultural chemicals, underground storage tanks, agricultural drainage wells, livestock wastes, and improper management of hazardous substances all contribute to ground water contamination. Several studies have detected low levels of common agricultural pesticides and synthetic organic compounds in both untreated and treated ground water. In most cases, the small concentrations are thought to pose no immediate threat to public health, but little is known about the health effects of long-term exposure to low concentrations of these chemicals.

Programs to Restore Water Quality

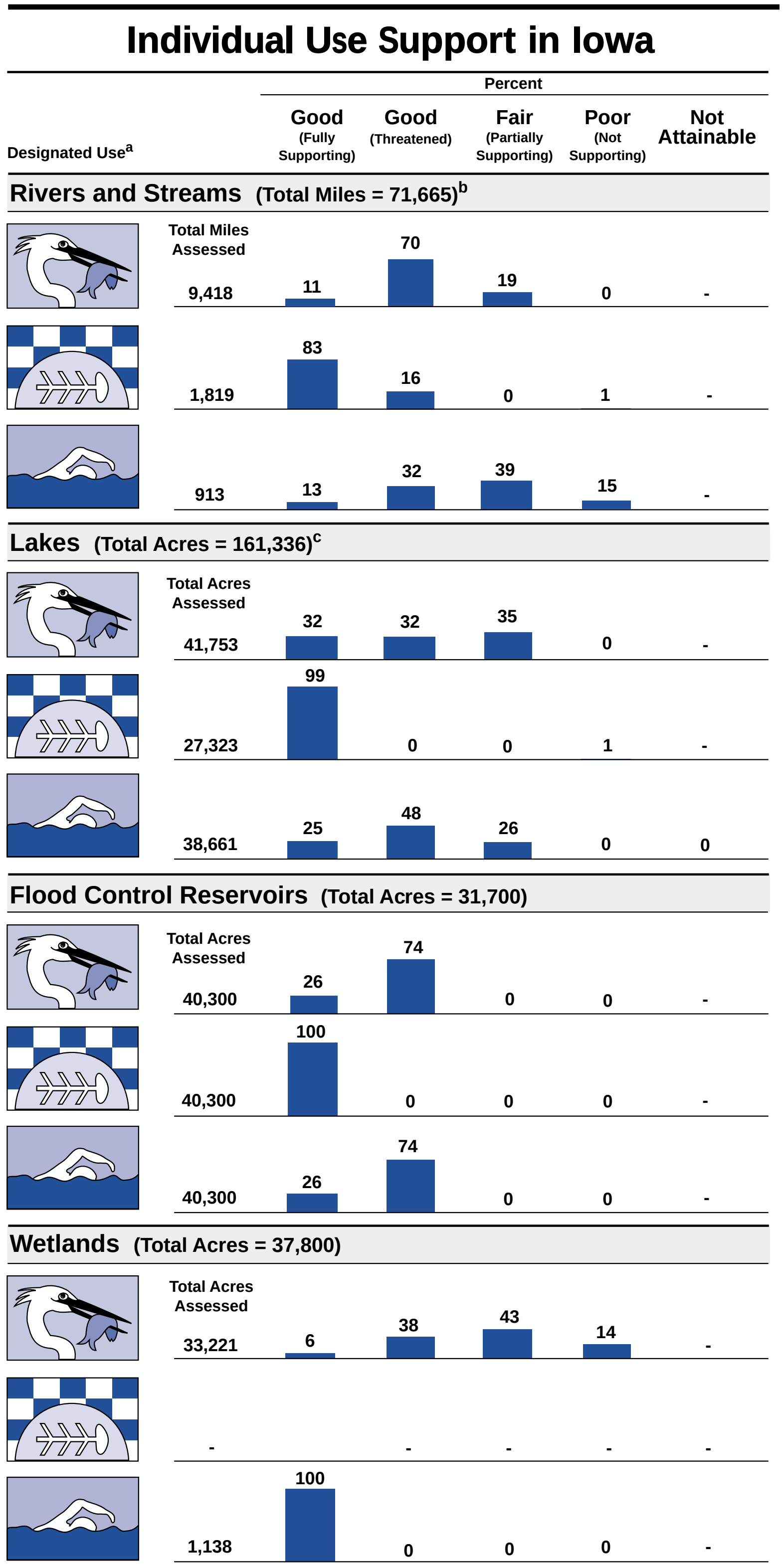
Pollution from municipal and industrial point sources is controlled primarily through the Clean Water Act's National Pollutant Discharge Elimination System through permits, development and enforcement of water quality standards, and legal action. The program also includes control of stormwater runoff from urban and industrial areas.

Sediment is the greatest pollutant, by volume, in Iowa. The state adopted a nonpoint control strategy of education projects and cost-share programs. Later, it adopted rules requiring that land disposal of animal wastes not contaminate surface and ground waters. Landfill rules require annual inspections and permit renewals every 3 years. Iowa regulates construction in floodplains to limit erosion and impacts on aquatic life. In 1990, a Nonpoint Source Program was developed whereby state and federal agencies cooperate to implement water quality projects, including education, demonstrations, and implementation of best management practices.

Programs to Assess Water Quality

Iowa's Department of Natural Resources (DNR) either maintains or cooperates in long-term sampling networks for both surface and ground waters. DNR routinely monitors metals, ammonia, and residual chlorine at fixed sampling sites. Limited sampling for agricultural pesticides began in 1995.

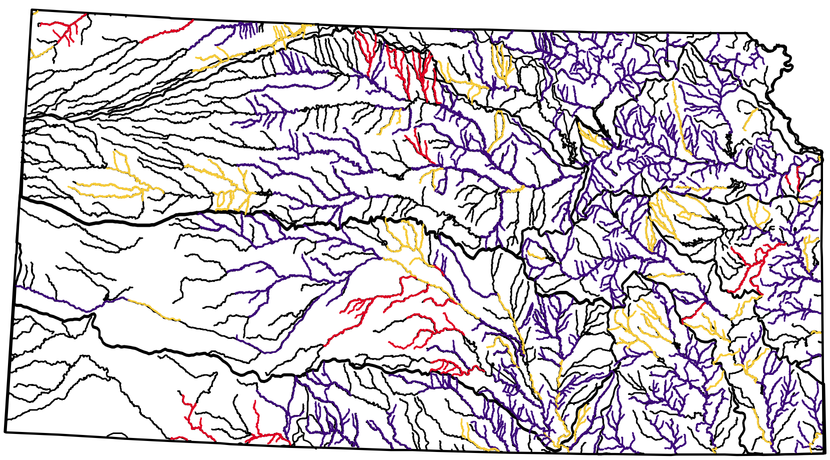
Information about toxic contaminants in fish is from long-term DNR/EPA and other monitoring programs. Toxins in sediment are monitored as part of a USGS study. The role of biological sampling is growing, with over 100 reference sites sampled so far. The development of volunteer monitoring programs will provide an additional source of water quality information.



[a] A subset of Iowa's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.
[c] Excludes flood control reservoirs.

Note: Figures may not add to 100% due to rounding.

Kansas



Fully Supporting
Threatened
Partially Supporting
Not Supporting
Not Assessed
Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

This map depicts aquatic life use support status.

For a copy of the Kansas 1998 305(b) report, contact:

Eva Hays
Kansas Department of Health and Environment
Bureau of Environmental Field Services
Forbes Field, Building 283
Topeka, KS 66620
(913) 296-1981
e-mail: ehays@kdhe.state.ks.us

Surface Water Quality

Kansas assessed water quality for 15,620 miles of streams during 1996-1997. Of these, 88% fully or partially support designated uses. Major causes of nonsupport are fecal coliform, organic enrichment, sulfates, and chlorides. Impairment of streams is attributed to agriculture, natural sources, hydromodification, and ground water withdrawal.

Of the public lakes assessed during the reporting period, 66% of the total acres are impaired for one or more uses. The major causes of impairment are sediment, turbidity, nutrients/eutrophication, and taste and odor problems. Agriculture and natural sources are the major sources of impairment for lakes. The trophic status of 68% of the assessed lake acreage is stable over time.

Most wetlands are on private lands. Of the public wetlands assessed, 29% support aquatic life use but are considered threatened, while food procurement use is fully supported but threatened in 91% of wetlands. The major causes of impairment are excessive nutrient load, flow alterations, low dissolved oxygen, and turbidity/siltation. Agriculture, hydromodifications in watersheds, and natural processes are the sources of impairment. As part of a special wetland project, 25,069 wetland acres were monitored for toxics (heavy metals, pesticides, and ammonia); 4% were found to be impacted. Trophic status studies indicate that 52% of the wetlands are stable over time.

Ground Water Quality

The Kansas Department of Health and Environment's (KDHE) ground water quality monitoring network is composed of 242 different types of wells and conducts the primary ambient ground water monitoring in the state. Nitrate contamination is a major concern. During 1996-1997 high nitrate concentration accounted for about 82% of the documented exceedances of federal drinking water maximum contaminant levels in ground water. Other ground water concerns included volatile organic compounds, heavy metals, petroleum products, and/or bacteria. The major sources of these contaminants included active industrial facilities, spills, leaking storage tanks, mineral extraction, and agricultural activities.

Programs to Restore Water Quality

A Local Environmental Protection Program provides financial assistance to 98 of the state's 105 counties to develop and implement a comprehensive plan for protection of the local environment.

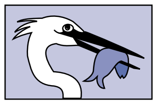
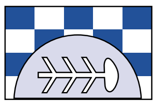
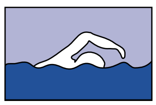
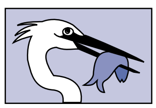
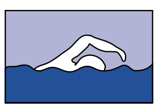
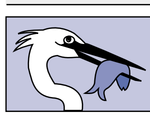
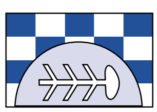
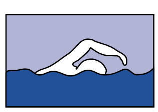
The Point Source Pollution Program regulates wastewater treatment systems of municipal, federal, industrial, and commercial sewage facilities, stormwater, and larger livestock operations. Smaller livestock facilities and other sources of pollutants are addressed by the Non Point Source Control Program. Directed funds, mainly to upgrade large wastewater treatment facilities serving cities, have resulted in documented water quality improvements at several locations.

All Clean Lakes Program projects are completed.

Programs to Assess Water Quality

Every year, KDHE collects and analyzes about 1,500 surface water samples, 50 aquatic macroinvertebrate samples, and 40 composite fish tissue samples from stations located throughout the state. Wastewater samples are collected at about 50 municipal sewage treatment plants, 20 industrial facilities, and 3 federal facilities to evaluate compliance with discharge permit requirements. KDHE also conducts special studies and prepares about 100 site-specific water quality summaries at the request of private citizens or other interested parties.

Individual Use Support in Kansas

Designated Use[a]		Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 134,338)[b]	Total Miles Assessed					
	15,620	73	0	18	9	0
	836	72	0	0	28	0
	1,697[c]	0	0	0	0	100
Lakes (Total Acres = 181,337)	Total Acres Assessed					
	181,337	0	51	47	2	0
	45,107	0	100	0	<1	0
	181,337[c]	0	49	49	2	0
Wetlands (Total Acres = 35,607)	Total Acres Assessed					
	35,607	0	29	5	66	-
	35,607	0	91	6	4	-
	-	-	-	-	-	-

– Not reported in a quantifiable format or unknown.

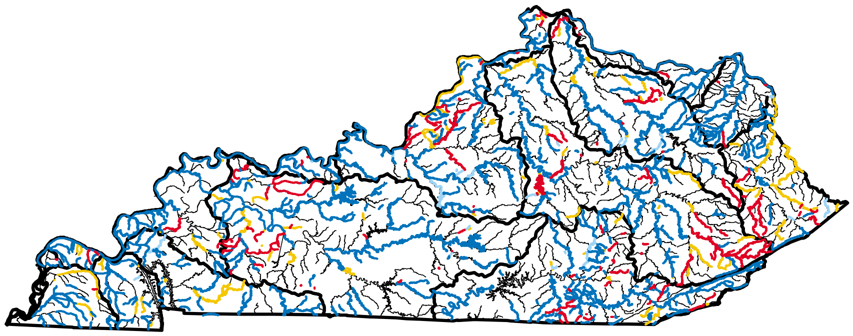
[a] A subset of Kansas' designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

[c] Kansas designated uses do not address swimming beaches. Refer to the Kansas 305(b) report on contact recreational use.

Note: Figures may not add to 100% due to rounding.

Kentucky



- Fully Supporting
- Threatened
- Partially Supporting
- Not Supporting
- Not Assessed
- Basin Boundaries (USGS 6-Digit Hydrologic Unit)

This map depicts aquatic life use support status.

For a copy of the Kentucky 1998 305(b) report, contact:

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Division of Water
14 Reilly Road
Frankfort Office Park
Frankfort, KY 40601
(502) 564-3410
e-mail: vanarsdall@nrdep.nr.state.ky.us

The report is also available on the Internet at: *http://water.nr.state.ky.us/305b/*

Surface Water Quality

About 75% of Kentucky's surveyed rivers (excluding the Ohio River) and 98% of surveyed lake acres have good water quality that fully supports aquatic life. Swimming use is fully supported in over 99% of the surveyed lake acres, but 75% of the river miles surveyed for bacteria do not fully support swimming. Fecal coliform bacteria, siltation, PCBs, and priority organics are the most common pollutants in Kentucky rivers. Frequently identified sources include urban runoff, resource extraction, sewage treatment facilities, land disposal of wastes, and agricultural activities. Nutrients, priority organics, and PCBs have the most widespread impacts on lakes. Potential sources include resource extraction, agriculture, and industrial discharges.

Declining trends in chloride concentrations and nutrients provide evidence of improving water quality in Kentucky's rivers and streams. Swimming advisories remain in effect on 86 miles of the North Fork Kentucky River, several streams in the upper Cumberland River basin, and the lower 5 miles of the Licking River and two tributary streams in northern Kentucky. Fish consumption advisories remain posted on three creeks for PCBs, the Ohio River for PCBs and chlordane, the Green River Lake because of PCB spills from a gas pipeline compressor station, and for five ponds on the West Kentucky Wildlife Management Area because of mercury contamination from unknown sources.

Ground Water Quality

Kentucky maintains an ambient ground water monitoring network of more than 100 sites. Underground storage tanks, septic tanks, spills, urban runoff, mining activities, agricultural activities, and landfills have been identified as the major sources of ground water contamination in Kentucky. Bacteria is the major pollutant in ground water. The state is concerned about the lack of ground water data, absence of ground water regulations, and the potential for ground water pollution in karst regions of the state.

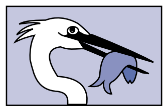
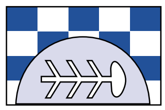
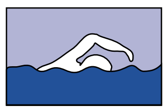
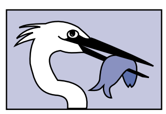
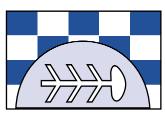
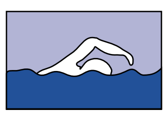
Programs to Restore Water Quality

Construction grants, state revolving loan fund monies, and other funding programs have funded the construction of 26 wastewater projects that were completed in 1995-1997. These projects either replaced outdated or inadequate treatment facilities or provided centralized treatment for the first time. Kentucky requires toxicity testing on many point source discharges and permits for stormwater outfalls and combined sewer overflows. The nonpoint source program oversees projects addressing watershed demonstrations, education, training, enforcement, technical assistance, and evaluation of best management practices.

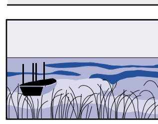
Programs to Assess Water Quality

Kentucky sampled 44 ambient monitoring stations characterizing about 1,432 stream miles during the reporting period. More than 60% of the state's least impacted streams have been monitored under the reference reach program. The state performed biological sampling at 17 of these stations in 1996 and 1997. Thirteen lakes were sampled to detect eutrophication trends. The state also performed 29 intensive studies to evaluate point source and nonpoint source impacts, establish baseline water quality measurements, and reevaluate water quality in several streams. Other data sources used by the state include discharge monitoring data, reports from the Kentucky Department of Fish and Wildlife Resources, and data from agencies such as the U.S. Geological Survey, the Army Corps of Engineers, the U.S. Forest Service, the Ohio River Valley Sanitation Commission, and Lexington and Louisville local governments.

Individual Use Support in Kentucky

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 49,105)[b]	Total Miles Assessed					
	8,276	72	3	12	13	-
	1,659	92	0	<1	7	-
	2,510	21	3	20	55	-
Lakes (Total Acres = 228,385)	Total Acres Assessed					
	217,480	74	24	2	<1	-
	205,712	96	0	4	0	-
	217,732	100	0	<1	0	-

Summary of Use Support in Kentucky

		Percent		
		Good (Fully Supporting)	Good (Threatened)	Impaired (For One or More Uses)
Wetlands (Total Acres = 975,593)	Total Acres Assessed			
	973,168	0	100	0

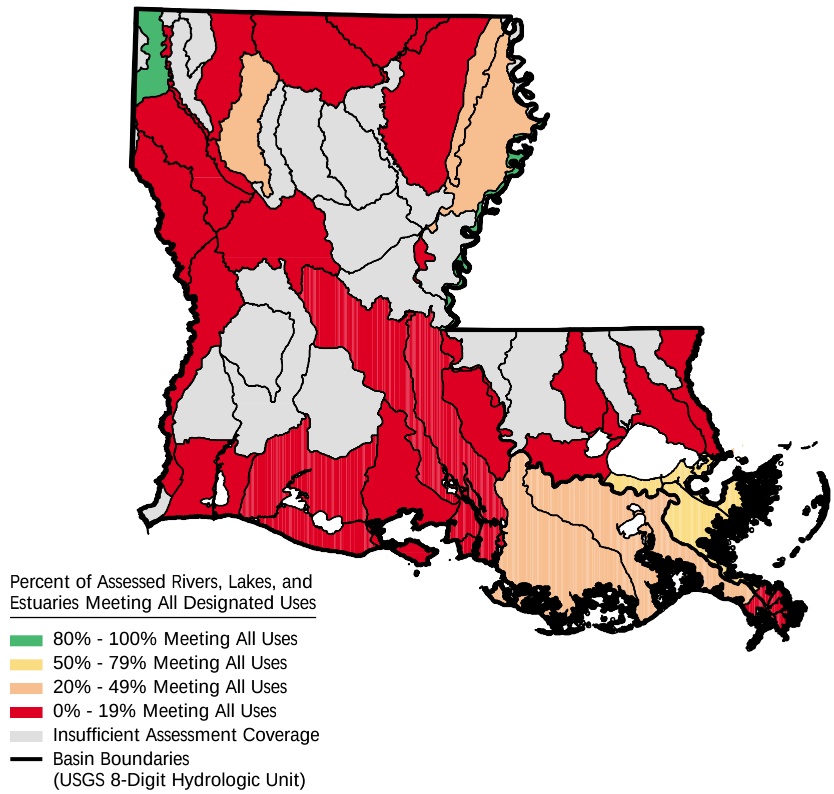
– Not reported in a quantifiable format or unknown.

[a] A subset of Kentucky's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Louisiana



For a copy of the Louisiana 1998 305(b) report, contact:

Albert E. Hindrichs
Louisiana Department of Environmental Quality
Office of Water Resources
Watershed Support Division
P.O. Box 82215
Baton Rouge, LA 70884-2215
(225) 765-0511
e-mail: al_h@deq.state.la.us

The report is also available on the Internet at: *http://www.deq.state.la.us/planning/305b/*

Surface Water Quality

About 15% of the assessed stream miles, 10% of the assessed lake acres, and 11% of the assessed estuarine square miles in Louisiana have good water quality that fully supports aquatic life. Metals are cited as the largest suspected cause of impairment to the state's rivers, lakes, and estuarine waters. This is due to closer scrutiny of metals criteria for water quality and the increased sampling of fish for a mercury contamination study. The state notes that much of the impairment due to metals criteria exceedances may be the result of sample contamination.

Organic enrichment/low dissolved oxygen, pathogens, and nutrients are also cited as major causes of stream impairment. Major sources of pollution to streams include agricultural practices, municipal point sources, and natural sources.

Major causes of lake impairment include organic enrichment/low dissolved oxygen, siltation, and turbidity. Major sources include atmospheric deposition, natural sources, and industrial point sources.

In estuarine waters, major causes of impairment include pathogen indicators and nutrients. Major sources of impairment include atmospheric deposition, natural sources, septic tanks, and land disposal.

Ground Water Quality

Water in the state's major aquifer systems continues to be of good quality. For this reporting cycle, EPA encouraged states to select an aquifer of hydrogeologic unit setting and discuss available data that best reflect the quality of the resources. Louisiana chose to discuss the baseline monitoring network for the Chicot Aquifer. The data indicated this aquifer to be of good quality with the exception of one well, indicating a localized area of concern.

Programs to Restore Water Quality

The water pollution controls employed by the Louisiana Department of Environmental Quality (LDEQ) include municipal and industrial wastewater discharge permits, enforcement of permit requirements, review and certification of projects affecting water quality, and implementation of best management practices for nonpoint sources. In 1997, LDEQ was granted NPDES delegation by EPA. The LDEQ's Water Quality Management Division has implemented a nonpoint source management program and has been successful in implementing voluntary controls and education efforts. This has been done through coordination with other concerned agencies, such as the State Department of Agriculture and Forestry, the U.S. Natural Resource Conservation Service, and the Louisiana State University Cooperative Extension Service.

Programs to Assess Water Quality

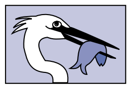
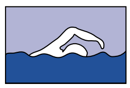
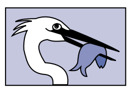
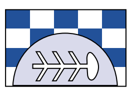
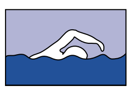
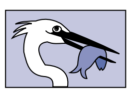
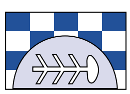
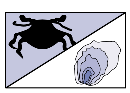
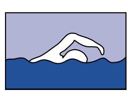
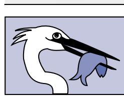
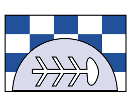
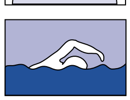
Louisiana's surface water monitoring program consists of a fixed-station long-term network, intensive surveys, special studies, and wastewater discharge compliance sampling. The LDEQ is currently revising its fixed-station monitoring program to operate on a 5-year cycle with sample collections occurring in two basins each year and rotating from year to year. While the state does not maintain a regular fish tissue monitoring program, fish are frequently sampled in response to complaints or as a result of enforcement actions.

– Not reported in a quantifiable format or unknown.

[a] A subset of Louisiana's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

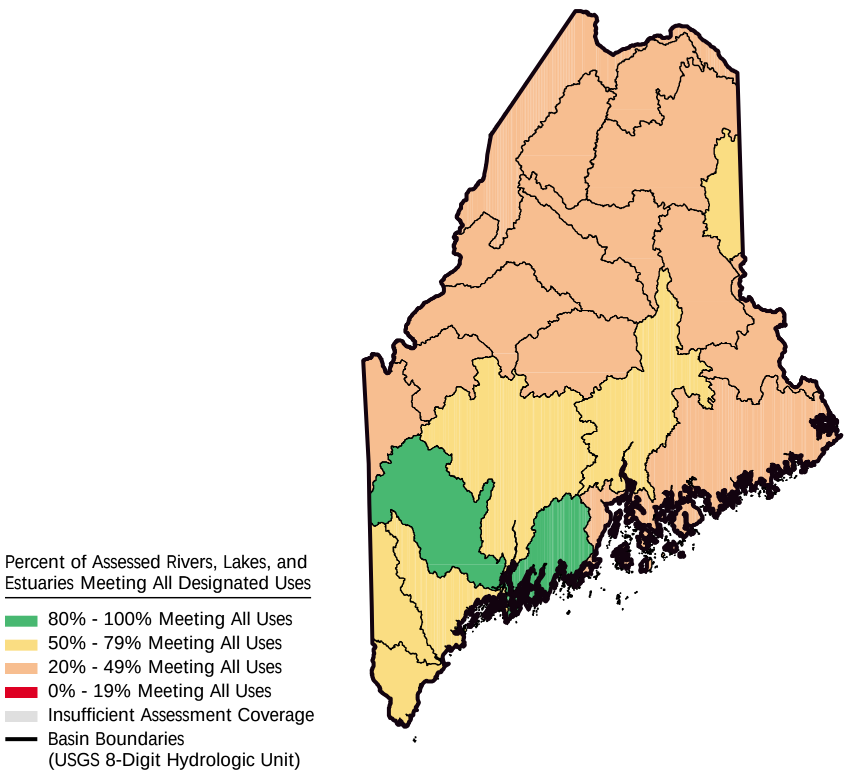
[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Louisiana

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 66,294)[b]						
	Total Miles Assessed 5,848	13	2	29	56	-
	-	-	-	-	-	-
	5,576	50	1	4	45	-
Lakes (Total Acres = 1,078,031)						
	Total Acres Assessed 375,114	8	2	68	23	-
	-	-	-	-	-	-
	349,643	97	0	<1	3	-
Estuaries (Total Square Miles = 7,656)						
	Total Square Miles Assessed 2,969	11	0	86	3	-
	-	-	-	-	-	-
	458	69	0	15	16	-
	1,606	37	24	1	39	-
Wetlands (Total Acres = 8,101,772)						
	Total Acres Assessed 667,520	1	0	99	0	-
	-	-	-	-	-	-
	464,000	100	0	0	0	-

Note: Figures may not add to 100% due to rounding.

Maine



For a copy of the Maine 1998 305(b) report, contact:

Dave Courtemanch
Maine Department of Environmental Protection
Bureau of Land and Water Quality
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Augusta, ME 04333
(207) 287-7789
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Surface Water Quality

Maine's water quality has significantly improved since enactment of the Clean Water Act in 1972. Atlantic salmon and other fish now return to Maine's rivers, and waters that were once open sewers are now clean enough to swim in. Ninety-nine percent of the state's river miles, 90% of the lake acres, and over 99% of the estuarine waters have good water quality that fully supports aquatic life uses. All lake waters in Maine are impaired due to a statewide fish consumption advisory. Oxygen-depleting substances from nonpoint sources and bacteria from inadequate sewage treatment are significant problems in rivers and streams. Major causes of impairment to lakes include nutrients, siltation, oxygen-depleting substances, and flow alterations. Sources of impairment include agriculture, forestry, urban runoff, and hydrologic modifications. Bacteria from municipal treatment plants, combined sewer overflows, and small dischargers contaminate shellfish beds in estuarine waters.

Ground Water Quality

The most significant ground water impacts include petroleum compounds from leaking underground and aboveground storage tanks, other organic chemicals from leaking storage facilities or disposal practices, and bacteria from surface disposal systems or other sources. Maine requires that all underground tanks be registered and that inadequate tanks be removed. About 23,000 tanks have been removed since 1986. Maine also regulates installation of underground storage tanks and closure of landfills to protect ground water resources from future leaks.

Programs to Restore Water Quality

As the state makes progress in restoring waters impacted by point sources, new water quality problems emerge from nonpoint sources. Therefore, the most important water quality initiatives for the future include implementing pollution prevention, nonpoint source management, watershed-based planning, coordinated land use management, and water quality monitoring. The state is linking pollution prevention with the watershed protection approach in a pilot project within the Androscoggin River basin. The state is also providing local officials and citizen groups with technical assistance to identify problem areas and develop local solutions for reducing pollution generation throughout the watershed.

The Maine Department of Environmental Protection completed a Strategic Plan that will be used to guide future environmental programs. The Strategic Plan is linked with the state of Maine's Performance Partnership Agreement with EPA. This Agreement provides an opportunity for greater dialogue and targeting on state priorities.

Programs to Assess Water Quality

Maine's surface water monitoring program includes ambient water quality monitoring, assimilative capacity and wasteload allocation studies, diagnostic studies, treatment plant compliance monitoring, and special investigations. Due to budgetary constraints, some of these activities are much more limited in scope than is desirable for accurately characterizing water quality conditions in Maine.

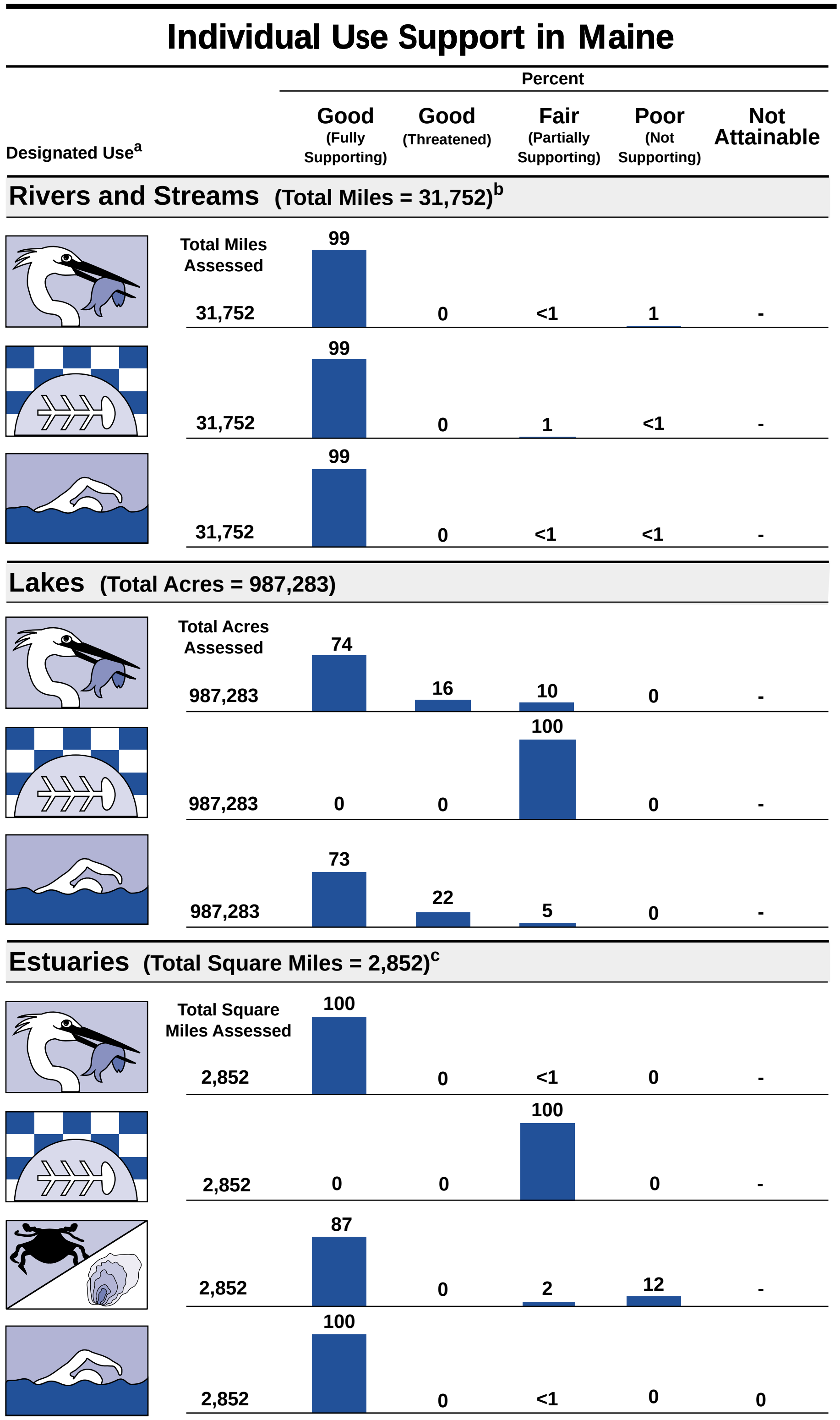
Maine started a pilot project in the Casco Bay watershed to develop biological assessment methods and criteria for wetlands.

– Not reported in a quantifiable format or unknown.

[a] A subset of Maine's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

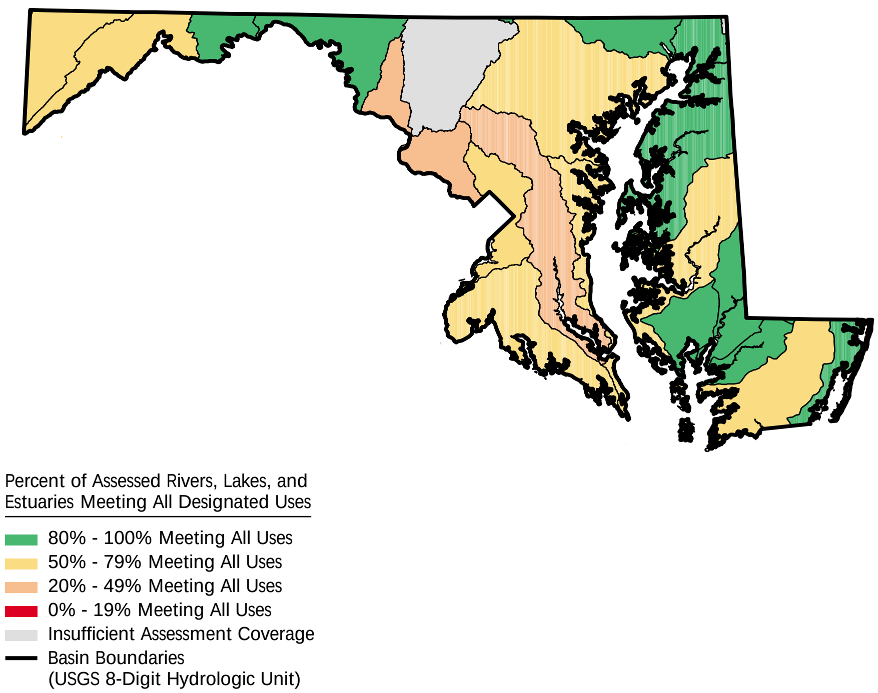
[b] Includes nonperennial streams that dry up and do not flow all year.

[c] Maine includes coastal shoreline waters in their assessment of estuarine waters.



Note: Figures may not add to 100% due to rounding.

Maryland



For a copy of the Maryland 1998 305(b) report, contact:

Sherm Garrison
Maryland Department of Natural Resources
Resource Assessment Service/TEA
Tawes State Office Building, D-2
Annapolis, MD 21401
(410) 260-8624
e-mail: sgarrison@dnr.state.md.us

Surface Water Quality

Overall, Maryland's surface waters have good quality, but excess nutrients, suspended sediments, bacteria, toxic materials, or stream acidity impact some waters. The most serious water quality problem in Maryland is the continuing accumulation of nutrients in estuaries and lakes from agricultural runoff, urban runoff, natural nonpoint source runoff, and point source discharges. Excess nutrients stimulate algal blooms and low dissolved oxygen levels that adversely impact water supplies and aquatic life.

Sources of sediment include agricultural and urban runoff, construction activities, natural erosion, dredging, forestry, and mining operations. In western Maryland, acidic waters from abandoned coal mines severely impact some streams. Agricultural, urban, and natural runoff and failing septic systems elevate bacteria concentrations, causing continuous shellfish harvesting restrictions in about 102 square miles of estuarine waters and temporary restrictions in another 71.1 square miles after major rainstorms.

Maryland did not report on the condition of wetlands.

Ground Water Quality

Maryland's ground water resource is of generally good quality. Localized problems include excess nutrients (nitrates) from fertilizers and septic systems; bacteria from septic systems and surface contamination; saline water intrusion aggravated by ground water withdrawals in the coastal plain; toxic compounds from septic tanks, landfills, and spills; petroleum products from leaking storage facilities; and acidic conditions and metals from abandoned coal mine drainage in western Maryland. Control efforts are limited to implementing agricultural best management practices and enforcing regulations for septic tanks, underground storage tanks, land disposal practices, and well construction.

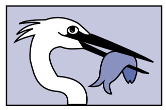
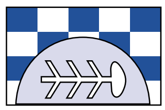
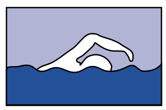
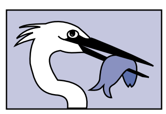
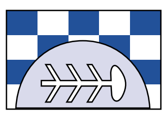
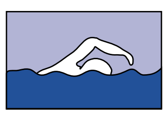
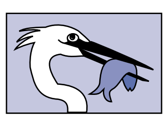
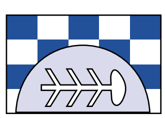
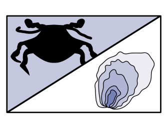
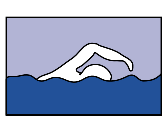
Programs to Restore Water Quality

Maryland manages nonpoint sources with individual programs for each individual nonpoint source category. Urban runoff is addressed through stormwater and sediment control laws that require development projects to maintain predevelopment runoff patterns through implementation of best management practices, such as detention ponds or vegetated swales. The Agricultural Water Quality Management Program supports many approaches, including Soil Conservation and Water Quality Plans, implementation of BMPs, and education. The Agricultural Cost Share Program has provided state and some federal funds to help offset the costs of implementing almost 8,000 agricultural BMPs since 1983.

Programs to Assess Water Quality

Maryland's monitoring programs include a combination of water chemistry, compliance, aquatic resource, and habitat monitoring programs. In addition to traditional monitoring, Maryland also conducts an innovative randomized sampling program in Chesapeake Bay waters using a probabilistic approach to sample analysis. Besides these programs, data from local governments and volunteer groups are available in some areas of the state.

Individual Use Support in Maryland

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 17,000)[b]	Total Miles Assessed					
	6,682	94	-	5	1	-
	17,000	100	-	0	0	-
	17,000	100	-	<1	<1	-
Lakes (Total Acres = 77,965)	Total Acres Assessed					
	21,010	37	-	63	0	-
	21,010	100	-	<1	0	-
	5,023	98	-	1	1	-
Estuaries (Total Square Miles = 2,522)	Total Square Miles Assessed					
	2,459	55	-	45	<1	-
	2,465	99	-	1	0	-
	1,839	92	0	4	4	-
	2,465	100	-	<1	<1	-

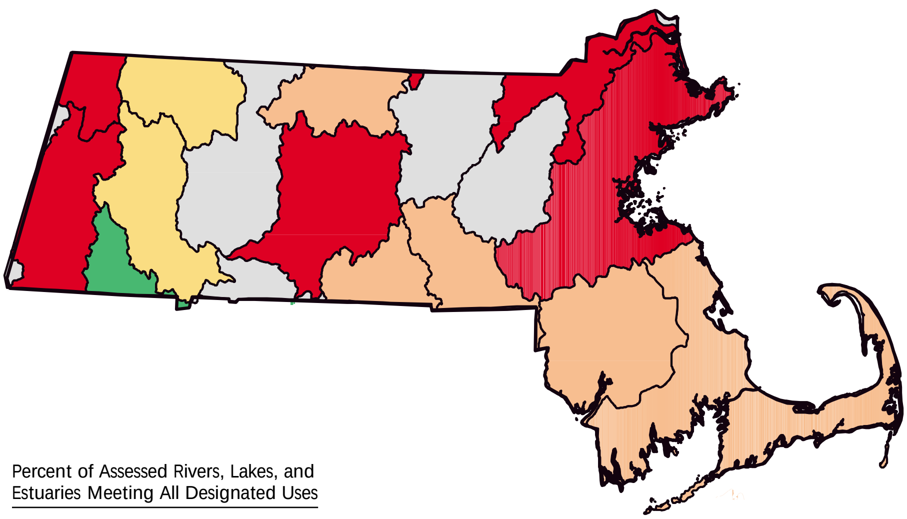
Note: Figures may not add to 100% due to rounding.

– Not reported in a quantifiable format or unknown.

[a] A subset of Maryland's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Massachusetts



For a copy of the Massachusetts 1998 305(b) report, contact:

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Surface Water Quality

More than half of the 1,495 river miles assessed by Massachusetts now support aquatic life, swimming, and boating uses, although half of the swimmable miles still experience at least intermittent problems. Twenty-five years ago, swimming and boating in most of these waters would have been unthinkable. The completion of river cleanup will require targeting various sources of pollution, primarily nonpoint source pollution from stormwater runoff and combined sewer overflows, and toxic contamination in sediments (largely historical).

Over a quarter (28%) of the assessed lake acreage, excluding Quabbin Reservoir, fully supports all beneficial uses. The causes of nonsupport include introductions of nonnative species, excessive growth of aquatic plants, and excess metals. The sources of these stressors are largely unknown, although nonpoint sources, including stormwater runoff and onsite wastewater systems, are largely suspected.

Massachusetts' marine waters lag behind its rivers in improvement. Only 32% of the assessed waters fully support all their uses. However, all the major urban areas along the coast either have initiated or are planning cleanup efforts. Foremost among these is a massive project to clean up Boston Harbor.

Ground Water Quality

Organic chemical contaminants have been detected in at least 245 ground water suppy wells (22% of reporting sources). Three percent have at least one exceedance of the MCL. Other contaminants include metals, chlorides, bacteria, inorganic chemicals, radiation, nutrients, turbidity, and pesticides. Since 1983, Massachusetts has required permits for all industrial discharges into ground waters and sanitary wastewater discharges of 15,000 gallons or more per day. The permits require varying degrees of wastewater treatment based on the quality and use of the receiving ground water. Additional controls are needed to eliminate contamination from septic systems and sludge disposal.

Programs to Restore Water Quality

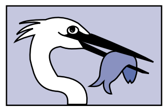
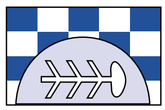
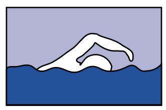
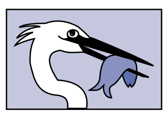
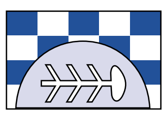
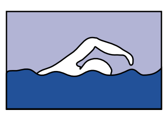
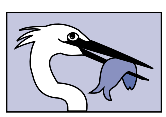
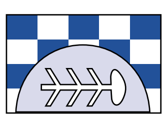
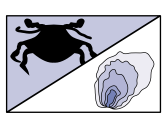
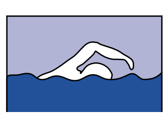
Wastewater treatment plant construction has resulted in significant improvements in water quality, but $7 billion of unfunded wastewater needs remain. The Nonpoint Source Control Program has implemented over 60 projects to provide technical assistance, implement best management practices, and educate the public. The state has also adopted a combined sewer overflow policy that provides engineering targets for cleanup and is currently addressing several CSO abatement projects.

Programs to Assess Water Quality

The Department of Environmental Protection (DEP) adopted a watershed planning approach to coordinate stream monitoring with wastewater discharge permitting, water withdrawal permitting, and nonpoint source control on a 5-year rotating schedule. The DEP is also adapting its monitoring strategies to provide information on nonpoint source pollution. For example, DEP will focus more on wet weather sampling and biological monitoring and less on chemical monitoring during dry periods in order to gain a more complete understanding of the integrity of water resources.

The state is developing biological assessment methods for coastal wetlands. The state is also partnering with two watershed organizations to train volunteers to monitor salt marshes.

Individual Use Support in Massachusetts

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 8,229)[b]	Total Miles Assessed					
	1,325	53	7	10	30	0
	679	40	0	0	60	0
	1,082	43	3	29	26	0
Lakes (Total Acres = 151,173)[c]	Total Acres Assessed					
	28,103	6	2	88	1	2
	10,479	2	0	0	92	6
	19,566	11	24	26	37	3
Estuaries (Total Square Miles = 2,728)[d]	Total Square Miles Assessed					
	135	47	1	17	36	0
	46	0	0	0	100	0
	-	-	-	-	-	-
	182	51	0	42	7	0

Note: Figures may not add to 100% due to rounding.

– Not reported in a quantifiable format or unknown.
[a] A subset of Massachusetts's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.
[c] Including Quabbin Reservoir (25,000 acres).
[d] Includes "marine waters"— harbors, bays, estuaries, and open ocean waters.

Michigan

For a copy of the Michigan 1998 305(b) report, contact:

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The report is also available on the Internet at: *http://www.deq.state.mi.us/swq/gleas/gleas.htm*

Surface Water Quality

Ninety-seven percent of Michigan's assessed river miles fully support aquatic life uses. Swimming use is also fully supported in 98% of the assessed rivers and over 99% of the assessed lake acres. Priority organic chemicals (in fish) are the major cause of nonsupport in more river miles than any other pollutant, followed by siltation and sedimentation, metals, and pathogens. Leading sources of pollution in Michigan include unspecified nonpoint sources, combined sewers, agriculture, contaminated sediments, municipal and industrial discharges, and urban runoff.

Water quality in Michigan's inland lakes is generally good to excellent, with a number of outstanding lakes. While almost all lakes support swimming, a generic fish consumption advisory is applied to all inland lakes due to widespread mercury contamination. Accelerated eutrophication (overenrichment) is also a concern in Michigan's lakes. Nutrient sources associated with human activities such as sewage, fertilizers, detergents, and surface runoff result in nuisance plant and algal growth.

Four of the five Great Lakes border Michigan. The open waters of Lakes Superior, Michigan, and Huron have good quality. Poor water quality is restricted to a few degraded locations near shore. Lake Erie's water quality has improved dramatically in the last two decades, due to pollutant discharge reductions for nutrients, metals, and oils. Water quality in Lake Huron has also improved due to water quality improvements in Saginaw Bay.

Ground Water Quality

Most of the ground water resource is of excellent quality, but certain aquifers have been contaminated with toxic materials leaking from waste disposal sites, businesses, or government facilities. The Michigan Ground Water Protection Strategy and Implementation Plan identifies specific program initiatives, schedules, and agency responsibilities for protecting the state's ground water resources.

Programs to Restore Water Quality

Major point source reductions in phosphorus and organic material loads have reduced or eliminated water quality problems in many Michigan waters. However, expanded efforts are needed to control nonpoint source pollution, eliminate combined sewer overflows, and reduce toxic contamination. Michigan has implemented an industrial pretreatment program, promulgated rules on the discharge of toxic substances, and regulated hazardous waste disposal facilities, but many toxicity problems are due to past activities that contaminated sediments and atmospheric loadings.

Programs to Assess Water Quality

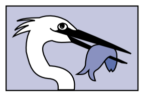
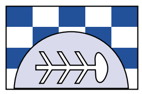
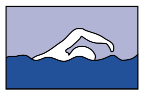
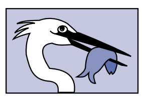
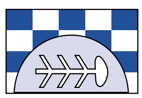
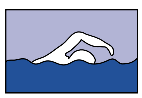
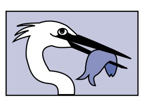
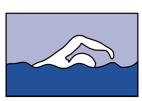
Michigan employs a 5-year watershed monitoring program cycle to track whether waters of the state meet water quality standards. Each year the state focuses on 9 to 19 of the 61 major watersheds in Michigan. The state's surface water monitoring strategy was recently updated, and additional funding of $500,000 per year was provided to bolster both "local" and state monitoring efforts. The enhanced program consists of eight interrelated monitoring elements: fish contaminants, water chemistry, sediment chemistry, biological integrity, physical habitat, wildlife contaminants, inland lake quality and eutrophication, and stream flow.

– Not reported in a quantifiable format or unknown.

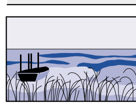
[a] A subset of Michigan's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Michigan

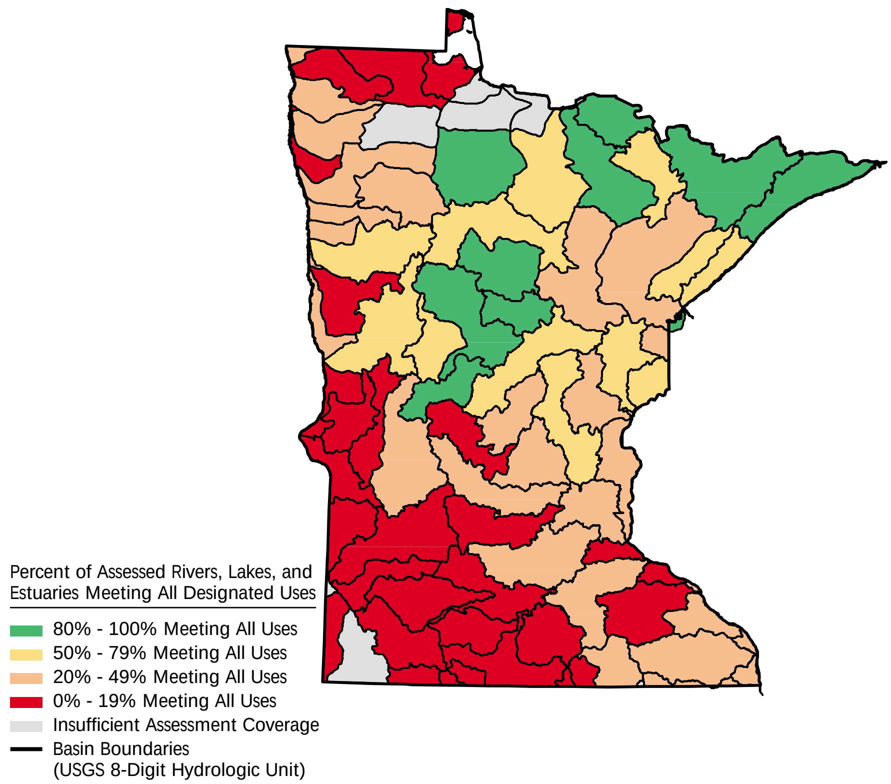
Designated Use[a]		Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 51,438)[b]	Total Miles Assessed					
	20,575	97	-	-	3	-
	20,576	96	-	-	4	-
	20,575	98	-	-	2	-
Lakes (Total Acres = 889,600)	Total Acres Assessed					
	8,154	-	-	-	100	-
	43,820	-	-	-	100	-
	491,931	100	-	-	<1	-
Great Lakes (Total Shore Miles = 3,250)	Total Shore Miles Assessed					
	0	-	-	-	-	-
	3,250	0	0	0	100	0
	3,250	100	0	0	<1	0

Summary of Use Support in Michigan

		Good (Fully Supporting) %	Good (Threatened) %	Impaired (For One or More Uses) %
Wetlands (Total Acres = 6,240,000)	Total Miles Assessed			
	10	100	-	0

Note: Figures may not add to 100% due to rounding.

Minnesota



For a copy of the Minnesota 1998 305(b) report, contact:

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(612) 296-7312
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Surface Water Quality

As part of its basin management approach, Minnesota reported on three basins for the state's 1998 305(b) report—the Upper Mississippi, Lower Mississippi, and St. Croix River basins. More than 50% of the state-assessed river miles have good quality that fully supports aquatic life uses, and 26% of the state-assessed rivers and over 67% of the state-assessed lake acres fully support swimming. The most common problems identified in rivers are bacteria, turbidity, nutrients, siltation, and dissolved oxygen. Nonpoint sources generate most of the pollution in rivers. Minnesota's 272 miles of Lake Superior shoreline have fish consumption advisories. These advisories recommend some limits on fish meals consumed for certain species and size classes. Most of the pollution originated from point sources has been controlled, but runoff (especially in agricultural regions) still degrades water quality.

Ground Water Quality

Ground water supplies the drinking water needs of 70% of Minnesota's population. The Minnesota Pollution Control Agency's (MPCA) Ground Water Monitoring and Assessment Program evaluates the quality of ground water. The program published several major reports in 1998, including statewide assessments of 100+ ground water constituents and of nitrates specifically. The program has now shifted emphasis to problem investigation and effectiveness monitoring, at local and small-regional scales.

Programs to Restore Water Quality

Basin Information Documents (BIDs) will include the 305b waterbody assessments as well as information on a wide variety of water resource issues and subjects. The BIDs will also include GIS maps depicting the locations of permitted feedlots in the state system and relative numbers of animal units per feedlot by major watershed. Based on the BIDs, teams will target specific waterbodies and watersheds for protection, restoration, or monitoring. Specific strategies will be spelled out.

Programs to Assess Water Quality

In the 1998 assessments, in addition to monitoring data collected by MPCA, data from the Metropolitan Council, U.S. Geological Survey, Long-Term Resource Monitoring Project, Mississippi Headwaters Board, local Clean Water Partnership projects and Hennepin County were used.

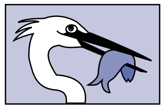
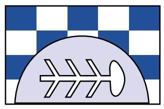
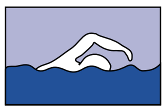
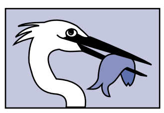
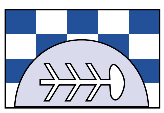
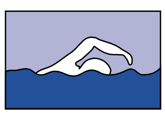
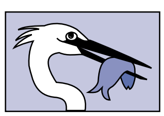
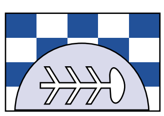
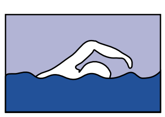
Minnesota maintains an Ambient Stream Monitoring Program with 82 sampling stations, and approximately 40 sites are visited each year. The state also performs fish tissue sampling, sediment monitoring, intensive surveys, and lake assessments and supports a citizen lake monitoring program.

In 1996, Minnesota piloted a statistically based water quality monitoring program in the St. Croix River basin. The program used multiple indicators to evaluate resource quality including fish and macroinvertebrate community structure, habitat, flow and basic water chemistry. Additional sites provided the data to develop regional biocriteria.

The state is developing biological assessment methods and criteria for depressional and riparian wetlands. A pilot effort is underway to develop a citizen wetland assessment program in cooperation with selected local governments.

The MPCA continues to be involved with field investigations into the cause of frog malformities. Partnerships with the National Institute of Environmental Health and the USGS Water Resources Division and Biological Resources Division have been particularly useful in carrying out teratogenic assays, histopathological studies, and water flow patterns at study sites.

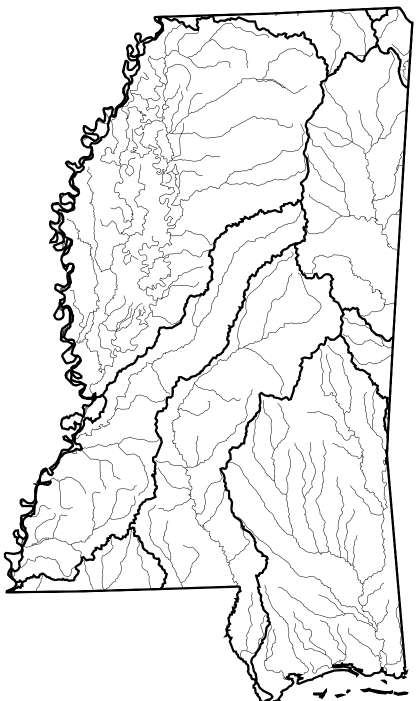
Individual Use Support in Minnesota

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 91,944)[b]	Total Miles Assessed					
	11,979	9	42	14	35	1
	-	-	-	-	-	-
	7,359	26	0	9	63	1
Lakes (Total Acres = 3,290,101)	Total Acres Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	2,531,239	58	9	20	13	0
Great Lakes (Total Shore Miles = 272)	Total Shore Miles Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Minnesota's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Mississippi



— Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Mississippi 1998 305(b) report, contact:

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Surface Water Quality*

Of the 46% of Mississippi's river miles assessed (3% monitored and 43% evaluated), 94% have fair water quality that partially supports aquatic life uses, and 1% have poor water quality that does not support aquatic life uses. About 97% of the assessed rivers are listed as not fully supporting swimming. The most common pollutants include nutrients, pesticides, suspended solids, and bacteria. Evaluative information suggests that agriculture is the most common source of pollution in rivers, followed by municipal sewage treatment plants.

Of the assessed lake acres, about 98% have good water quality that fully support aquatic life uses, and over 99% fully support swimming. Nutrients, metals, siltation, pesticides, and oxygen-depleting substances are the most common pollutants, and agriculture is the dominant source of pollution in Mississippi's lakes.

Over 88% of assessed estuaries have good quality that fully supports aquatic life uses. The most common pollutants in estuaries are organic enrichment, turbidity, and bacteria. The state attributes these pollutants to urban runoff/storm sewers, septic systems, and land disposal activities. Of the waters assessed for shellfish harvesting, 61% are listed as restricted or prohibited. Most of the restrictions are mandates by the state's Shellfish Sanitation program. Twenty percent are classified as buffer zones bordering ship channels, and most of the remainder is classified as restricted due to proximity to wastewater outfalls.

The state has posted eight fish consumption advisories and three commercial fishing bans due to elevated concentrations of PCBs, PCP, dioxins, and/or mercury detected in fish tissues.

Mississippi did not report on the condition of wetlands.

Ground Water Quality

Extensive contamination of drinking water aquifers and public water supplies is uncommon in Mississippi although localized ground water contamination has been detected. The most frequently identified sources of contamination are leaky underground storage tanks and faulty septic systems. Brine contamination is also a problem near oil fields. Little data exist for domestic wells. Ground water protection programs include the Pesticide Container Recycling, Underground Storage Tank, Underground Injection Control, Agrichemical Ground Water Monitoring, and Wellhead Protection Programs (approved by EPA in 1993).

*Assessed river percentages presented in this summary are based on the state's electronic submittal of 305(b) data. Due to the state's use of evaluated nonpoint source assessment data, which focused on potential problem areas (92% of the total assessed river mileage), the resulting 305(b) data are biased toward these waters. These evaluated waters have no known monitoring data indicating impairment.

Programs to Restore Water Quality

Mississippi developed and adopted (1994, after public review) comprehensive regulations for conducting Section 401 Water Quality Certifications, enabling the state to review federal licenses and permits for compliance with state water quality standards. Mississippi also expanded its definition of waters of the state to include wetlands and ground waters.

Programs to Assess Water Quality

Historically, the state annually sampled about 25 of their 57 historical fixed monitoring stations on a rotating schedule. The state has been able to significantly expand its fixed monitoring network to 143 stations statewide.

The state now monitors physical and chemical parameters monthly, metals in the water column quarterly, and biological parameters once a year. Several stations are also sampled annually for metals and pesticides in fish tissues.

In 1997, the state also adopted its Basinwide Approach to water quality management.This basinwide approach is supported by a rotating basin fixed-station monitoring network that augments the statewide network of ambient monitoring stations.

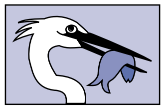
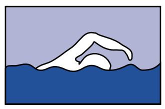
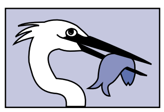
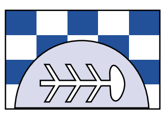
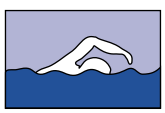
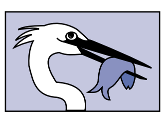
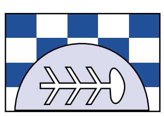
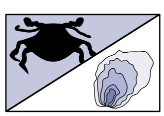
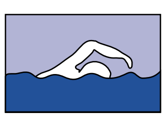
– Not reported in a quantifiable format or unknown.

[a] A subset of Mississippi's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

[c] Mississippi notes its assessments are biased due to the state's extensive use of evaluated nonpoint source assessment data, which focused on problem areas.

Individual Use Support in Mississippi

Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 84,003)[b,c]	Total Miles Assessed					
	38,711[c]	2	3	94	1	<1
	961	47	27	24	2	0
	11,994[c]	1	1	93	4	0
Lakes (Total Acres = 500,000)	Total Acres Assessed					
	274,497	66	32	2	0	0
	272,337	47	43	10	<1	0
	31,923	100	0	<1	0	0
Estuaries (Total Square Miles = 760)	Total Square Miles Assessed					
	199	10	79	11	0	0
	50	43	57	0	0	0
	43	34	5	61	0	0
	339	65	28	7	0	0

Note: Figures may not add to 100% due to rounding.

Missouri

Segment 80% -100% Fully Supporting
Segment 50% - 79% Fully Supporting
Segment 20% - 49% Fully Supporting
Segment 0% - 19% Fully Supporting
Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

This map depicts aquatic life use support status.

For a copy of the Missouri 1998 305(b) report, contact:

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Missouri Department of Natural Resources
Water Pollution Control Program
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Surface Water Quality

Almost half of Missouri's rivers and streams have impaired aquatic habitat due to a combination of factors including natural geology, climate, and agricultural land use. As a result of these factors, many streams suffer from low water volume, organic enrichment, and excessive siltation. In lakes, low dissolved oxygen from upstream dam releases, pesticides, and metals are the most common ailments. Agriculture, reservoir releases, contaminated sediments, and urban runoff are the leading sources of lake degradation.

The Missouri Department of Health advises that the public restrict consumption of bottom-feeding fish (such as catfish, carp, and suckers) from urban waters and non-Ozark streams or lakes to 1 pound per week due to concentrations of chlordane, PCBs, and other contaminants in these fish.

Missouri did not report on the condition of wetlands.

Ground Water Quality

In general, ground water quantity and quality increases from north to south and west to east. Deep ground water aquifers in northern and western Missouri are not suitable for drinking water due to high concentrations of minerals from natural sources. Nitrates and, to a much lesser extent, pesticides also contaminate wells in this region. About one-third of the private wells exceed drinking water standards for nitrates, and about 2% of private wells exceed drinking water standards for either atrazine or alachlor. Statewide, the highest priority concerns include ground water contamination from septic tanks, pesticide and fertilizer applications, and underground storage tanks.

Programs to Restore Water Quality

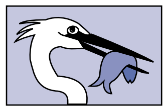
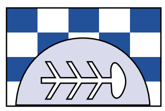
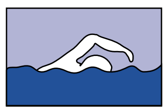
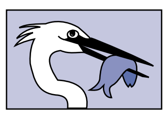
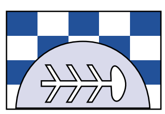
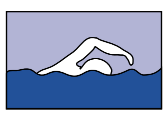
Sewage treatment plant construction has restored many surface waters in Missouri, but point sources still impact about 90 classified stream miles. The Missouri Clean Water Commission has revised its regulations to bring confined animal operations into the point source permit program consistent with federal requirements. Nonpoint source control efforts have been greatly expanded over the past few years. With a focus on agriculture, approximately $2 million annually is spent for statewide informational programs, technical assistance and demonstrations on a regional and local basis, and BMP implementation in local watersheds. A dedicated state sales tax provides an additional $28 million annually for watershed-level soil erosion control programs.

Programs to Assess Water Quality

Missouri's water quality monitoring strategy features approximately 40 fixed-station chemical ambient monitoring sites, short-term intensive chemical monitoring studies, a rapid visual/aquatic invertebrate assessment program and detailed biological sampling in support of development of biocriteria. The state also reviews water quality monitoring data and published studies done by others.

Missouri requires toxicity testing of effluents for all major dischargers; has a fish tissue monitoring program for selected metals, pesticides and PCBs; and monitors river sediments for toxic metals and organics and sediment pore water for toxicity. Several nonpoint source watershed projects related to management of manure or farm chemicals have their own monitoring programs.

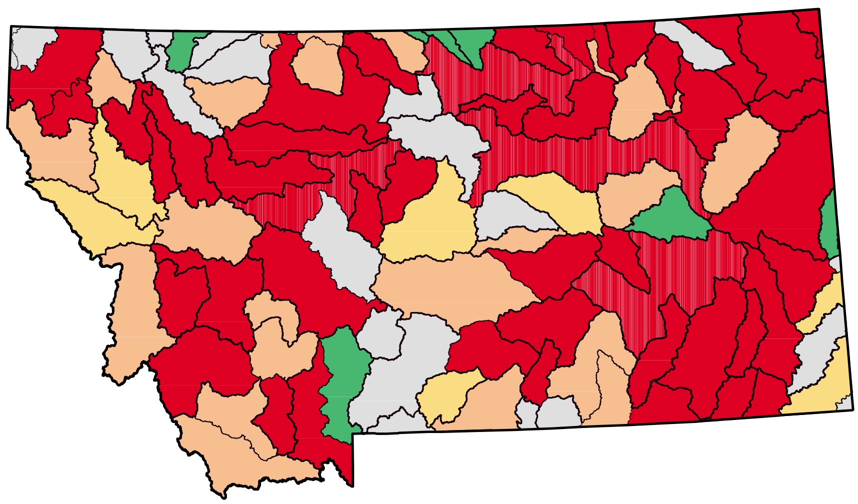
Individual Use Support in Missouri

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 51,978)[b]	Total Miles Assessed					
	21,585	53	-	46	1	-
	21,978	99	-	0	1	-
	5,412	99	-	0	1	-
Lakes (Total Acres = 292,204)	Total Acres Assessed					
	292,204	99	-	<1	1	-
	259,615	100	-	0	<1	-
	261,451	100	-	0	0	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Missouri's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Montana



For a copy of the Montana 1998 305(b) report, contact:

Robert L. Barry
Montana Department
of Environmental Quality
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Helena, MT 59601
(406) 444-5342
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Surface Water Quality

Water quality assessments have been done on about 10% of Montana's 177,000 stream miles and 94% of the 845,000 lake acres. These assessments have focused primarily on the largest lakes and the perennial streams where water quality problems were expected, so the results are not representative of overall state water quality. Of the assessed stream mileage, 41% has been found to fully support all uses, 52% is rated as partially supporting intended uses, while 8% does not support one or more uses. Approximately 57% of Montana's assessed lake acreage fully supports swimming and drinking water uses. Assessed lake acreage either fully supports (14%) or partially supports (86%) aquatic life use, with reservoir water level fluctuations being the primary reason for partial support classification. Nonpoint sources of pollution produce most stream and lake impairment in the state.

Ground Water Quality

More than 50% of Montanans get their domestic water supply from ground water sources. Ground water is plentiful and the quality is generally excellent, but Montana's aquifers are vulnerable to pollution from increased human activity associated with population growth. A new statewide ground water plan to protect ground water quality and quantity has just been completed, and implementation is underway.

Programs to Restore Water Quality

Montana is actively pursuing interagency/interdisciplinary watershed planning and management. The Montana Watershed Coordination Council brings together all water quality stakeholders to promote and coordinate watershed protection efforts. During 1998, state agencies participated with federal environmental agencies in development of unified watershed assessments under the federal Clean Water Action Plan initiative. Since the most prevalent impacts to state waters are from nonpoint sources, management of these sources is key to water quality protection and restoration. The state Nonpoint

Source Management Plan employs an approach emphasizing education and voluntary action supported by permits for selected activities. It focuses on three major source categories: agriculture, mining, and forestry. TMDL implementation plan development and other watershed planning efforts use a collaborative process to identify and prioritize management options that will address all major factors threatening or degrading water quality.

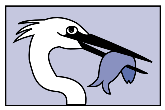
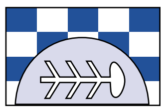
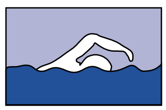
Programs to Assess Water Quality

In 1997 the Montana Water Quality Act was amended to provide new mandates and increased funding for water quality assessment and planning. The Montana Department of Environmental Quality was directed to complete, by October of 1999, a review of the state list of impaired waterbodies evaluating the adequacy of the data used in list development. Waterbodies lacking sufficient credible data will be targeted for immediate reassessment. The process used to determine which impaired streams or lakes receive priority for the development of TMDL implementation plans is also being revised. Finally, an ambient water quality monitoring program is being implemented. The objectives of this program are to provide an unbiased indicator of current statewide water quality that will also support trend analysis as information accumulates.

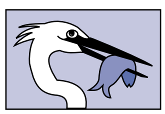
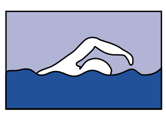
Montana is developing biological assessment methods and criteria for wetlands.

Individual Use Support in Montana

Rivers and Streams (Total Miles = 176,750)[b]

Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
	17,874	19	22	52	8	-
	-	-	-	-	-	-
	-	-	-	-	-	-

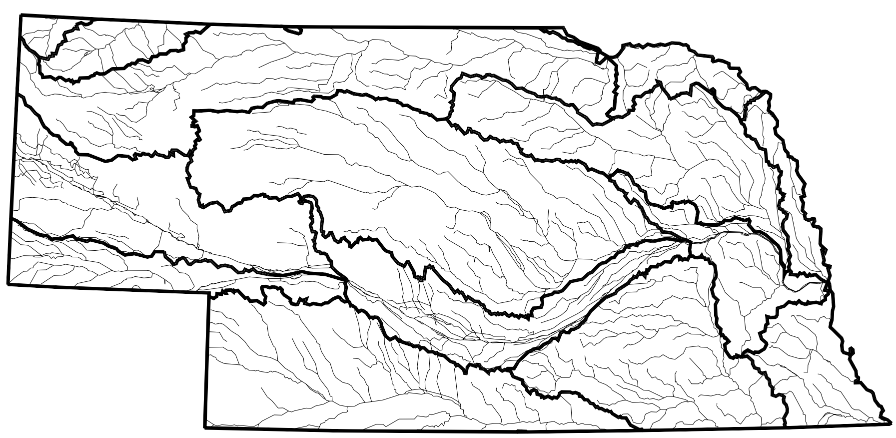
Lakes (Total Acres = 844,802)

Designated Use[a]	Total Acres Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
	797,190	14	-	86	0	-
	-	-	-	-	-	-
	798,584	57	-	42	<1	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Montana's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Nebraska



Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Nebraska 1998 305(b) report, contact:

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Nebraska DEQ
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Surface Water Section
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Lincoln, NE 68509-8922
(402) 471-4249
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Surface Water Quality

Agriculture is the most widespread source of water quality problems in Nebraska, but urban runoff is also a concern. Agricultural runoff introduces excess sedimentation, bacteria, suspended solids, pesticides, and nutrients into surface waters. Municipal and industrial facilities may contribute ammonia, bacteria, and metals. Channelization and hydrologic modifications have impacted aquatic life in Nebraska streams by reducing the diversity and availability of habitat. Monitoring has revealed that current water quality criteria for the herbicide atrazine is being exceeded

Nutrient enrichment and sedimentation were the most common water quality problems identified in lakes, followed by siltation, suspended solids, and nutrients. Sources of pollution in lakes include agriculture, construction, and urban runoff. Nebraska also has 36 fish consumption advisories in effect. The contaminants of concern include methylmercury, dieldrin, and PCBs.

Ground Water Quality

Although natural ground water quality in Nebraska is good, hundreds of individual cases of ground water contamination have been documented. Major sources of ground water contamination include agricultural activities, industrial facilities, leaking underground storage tanks, oil or hazardous substance spills, solid waste landfills, wastewater lagoons, brine disposal pits, and septic systems.

Programs to Restore Water Quality

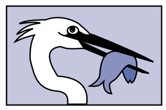
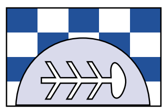
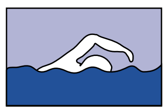
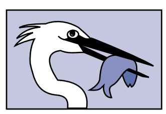
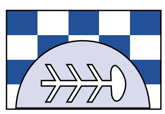
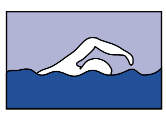
Nebraska's Nonpoint Source (NPS) Management Program concentrates on protecting ground and surface water resources by performing watershed assessments and promoting implementation projects. Currently, Nebraska has 34 Section 319 funded NPS-related projects.

Nebraska revised wetland water quality standards to protect beneficial uses of aquatic life, aesthetics, wildlife, and agricultural water supply. The state also protects wetlands with the water quality certification program and water quality monitoring.

Programs to Assess Water Quality

The state's Nonpoint Source Management Program cannot be effective without monitoring information to identify and prioritize waters impacted by NPS, develop NPS control plans, and evaluate the effectiveness of implemented best management practices. In response to this need, Nebraska developed an NPS surface water quality monitoring strategy to guide NPS monitoring projects. During 1996 and 1997, the state conducted three watershed assessments, diagnostic/feasibility studies for three lakes, and ongoing BMP effectiveness studies in 10 watersheds.

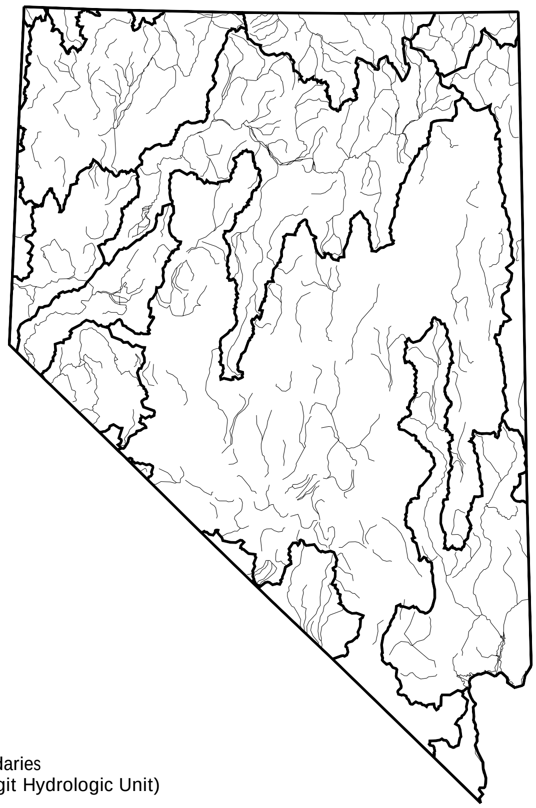
Individual Use Support in Nebraska

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 81,573)[b]						
	Total Miles Assessed 3,264	61	16	19	5	-
	1,850	52	48	0	0	-
	1,816	8	<1	18	73	-
Lakes (Total Acres = 280,000)						
	Total Acres Assessed 121,725	68	13	19	<1	-
	123,172	59	41	0	0	-
	109,806	100	0	<1	0	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Nebraska's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Nevada



For a copy of the Nevada 1998 305(b) report, contact:

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Surface Water Quality

Only 10% (about 15,000 miles) of Nevada's rivers and streams flow year round, and most of these waters are inaccessible. For this reporting period, Nevada assessed 1,631 miles of the 3,000 miles of accessible perennial streams for aquatic life uses. Fifty-one percent of the assessed stream miles fully supported this use, while 42% partially supported aquatic life use and 7% did not support this use. In lakes, 74% of the assessed acres fully supported aquatic life uses.

Agricultural practices (irrigation, grazing, and flow regulation) have the greatest impact on Nevada's water resources. Agricultural sources generate large sediment and nutrient loads. Urban drainage systems contribute nutrients, heavy metals, and organic substances that deplete oxygen. Flow reductions also have a great impact on streams, limiting dilution of salts, minerals, and pollutants.

Ground Water Quality

Nevada lacks comprehensive ground water protection legislation, but the state does have statutes that control individual sources of contamination, including mining, underground storage tanks, septic systems, handling of hazardous materials and waste, solid waste disposal, underground injection wells, agricultural practices, and wastewater disposal. Land use statutes also enable local authorities to implement Wellhead Protection Plans by adopting zoning ordinances, subdivision regulations, and site plan review procedures. Local authorities can implement certain source control programs at the local level.

Programs to Restore Water Quality

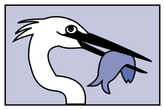
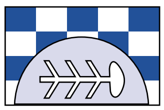
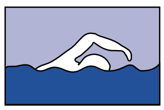
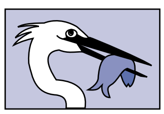
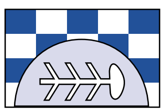
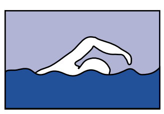
Nevada's Nonpoint Source Management Plan aims to reduce NPS pollution with interagency coordination, education programs, and incentives that encourage voluntary installation of best management practices. The state's current approach to controlling nonpoint sources is to seek voluntary compliance through nonregulatory programs of technical and financial assistance, training, technology transfer, demonstration projects, and education. In 1994, the state updated the *Handbook of Best Management Practices* and supported NPS assessment activities in each of the state's six major river basins. Nevada's Wellhead Protection Program was finalized in January of 1994.

Programs to Assess Water Quality

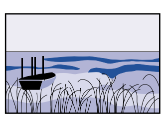
Several state, federal, and local agencies regularly sample chemical and physical parameters at over 100 sites in the 14 hydrologic regions of the state. The state also coordinates intensive field studies on Nevada's major river systems, the Truckee River Basin, Carson River Basin, Walker River Basin, and the Humboldt River Basin. The state also monitors a number of lakes and reservoirs. Additional monitoring data are provided by the U.S. Geological Survey and the Nevada Division of Agriculture (pesticide detection).

– Not reported in a quantifiable format or unknown.
[a] A subset of Nevada's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Nevada

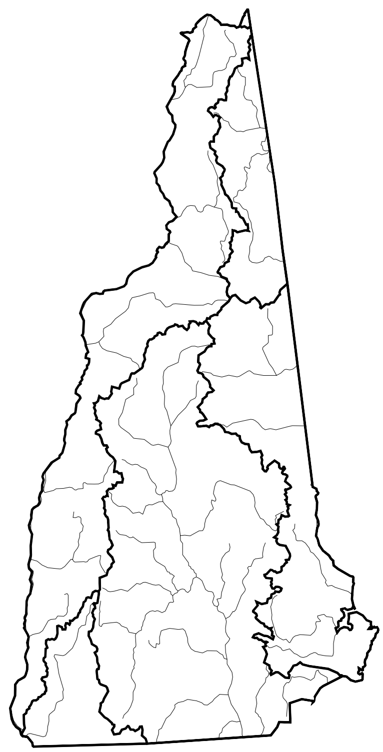
Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 143,578)[b]	Total Miles Assessed					
	1,631	51	-	42	7	-
	-	-	-	-	-	-
	1,542	87	-	12	2	-
Lakes (Total Acres = 533,279)	Total Acres Assessed					
	212,336	74	-	8	18	-
	-	-	-	-	-	-
	173,444	100	-	<1	0	-

Summary of Use Support in Nevada

		Percent		
		Good (Fully Supporting)	Good (Threatened)	Impaired (For One or More Uses)
Wetlands (Total Acres = 136,650)	Total Acres Assessed			
	21,326	100	-	0

Note: Figures may not add to 100% due to rounding.

New Hampshire



For a copy of the New Hampshire 1998 305(b) report, contact:

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Concord, NH 03301
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e-mail: g_comstock@des.state.nh.us

Surface Water Quality

In 1994, New Hampshire issued a statewide freshwater fish consumption advisory due to mercury levels found in fish tissue, the primary source of which is believed to be atmospheric deposition from upwind states. When this advisory is included in the assessment, all fresh surface waters are, by definition, less than fully supporting all uses. If this advisory is not included in the assessment, however, over 84% of assessed river miles and 97% of assessed lake acres fully support all uses.

All of the state's estuarine waters fully support swimming, and nearly 99% support aquatic life uses. None of the estuaries, however, fully support fish and shellfish consumption. Approximately 60% of the shellfish beds are closed due to bacteria, and 84% of the estuaries are defined as impaired because of a consumption advisory due to PCBs in lobster tomalley. All tidal waters are considered impaired for fish consumption due to a consumption advisory for PCBs in bluefish.

Excluding the statewide freshwater fish advisory for mercury, metals, PCBs, and bacteria are the leading causes of impairment in rivers. Low pH, exotic weeds, and nutrients are the major causes of impairment in lakes. Nonpoint sources are believed to be responsible for most of the pollution entering New Hampshire's waters.

New Hampshire did not report on the condition of wetlands.

Ground Water Quality

New Hampshire is highly dependent on ground water for drinking water. Natural ground water quality from stratified aquifers is generally good; however, aesthetic concerns such as taste and odor exist. Bedrock well water quality is also generally good, although this water can be impacted by naturally occurring contaminants including flouride, arsenic, mineral radioactivity, and radon gas.

In addition to naturally occurring contaminants, there are many areas of localized contamination due primarily to releases of petroleum and volatile organic compounds from petroleum facilities, commercial and industrial operations, and landfills. Sodium from widespread winter application of road salt is also a contaminant of concern.

Programs to Restore Water Quality

New Hampshire has numerous laws, regulations, and programs to abate pollution from point and nonpoint sources. Over the past 25 years, all significant discharges of untreated municipal and industrial wastewater have been eliminated. To resolve remaining nonpoint source problems, the Department of Environmental Services (DES) initiated a watershed protection approach in 1995, which is in the process of being refined.

Programs to Assess Water Quality

DES has several lake assessment programs including an excellent volunteer monitoring program. DES implemented a 3-year rotating watershed monitoring program for rivers in 1989, and started a volunteer river monitoring program in 1997. To determine the ecological health of surface waters, DES initiated a biomonitoring program in 1995. In the future, DES hopes to develop and implement a probability-based monitoring strategy to provide more comprehensive assessments.

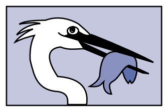
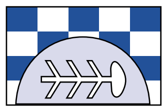
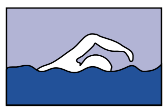
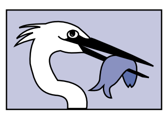
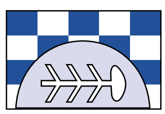
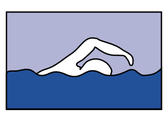
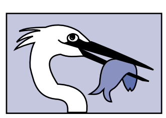
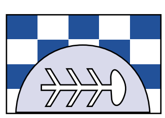
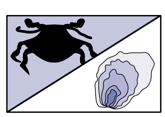
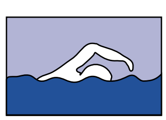
– Not reported in a quantifiable format or unknown.

[a] A subset of New Hampshire's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

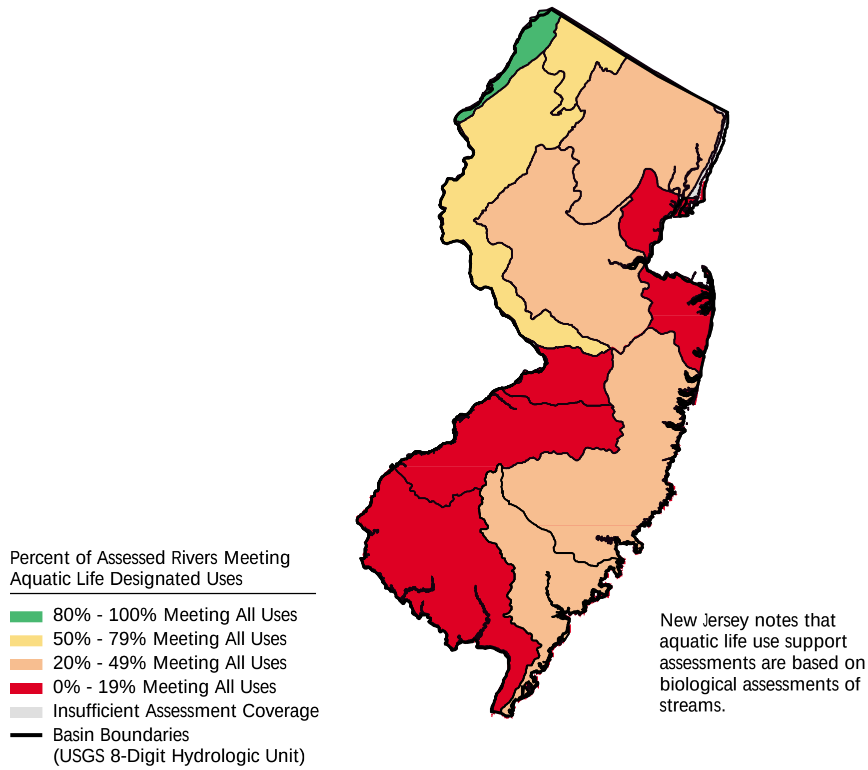
[c] Excluding the statewide freshwater fish consumption advisory due to mercury.

Individual Use Support in New Hampshire

Designated Use[a]		Good (Fully Supporting) (%)	Good (Threatened) (%)	Fair (Partially Supporting) (%)	Poor (Not Supporting) (%)	Not Attainable (%)
Rivers and Streams (Total Miles = 10,881)[b, c]	Total Miles Assessed					
	2,542	95	-	5	<1	0
	279	0	-	95	5	0
	2,566	97	-	2	2	0
Lakes (Total Acres = 170,009)[c]	Total Acres Assessed					
	161,464	97	-	2	1	0
	170,009	100	-	0	0	0
	161,201	99	-	1	0	0
Estuaries (Total Square Miles = 28)	Total Square Miles Assessed					
	28	99	-	1	0	0
	28	0	-	100	0	0
	28	0	-	42	58	0
	28	100	-	0	0	0

Note: Figures may not add to 100% due to rounding.

New Jersey



For a copy of the New Jersey 1998 305(b) report, contact:

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Surface Water Quality

Surface water quality has remained excellent in undeveloped areas. However, 12% of the 3,815 assessed stream miles exhibited severely impaired aquatic biota, 52% were moderately impaired, and 35% were not impaired. All of the state's lakes are believed to be either threatened or actively deteriorating. Estuarine and coastal waters are generally in better condition. Shad populations have increased in the Delaware River from about 150,000 in 1980 to almost 800,000 in 1996 due to improvements in water quality. New Jersey has increased acres available for shellfish harvest since 1980, and over 86% of available shellfish beds are now available for harvest. All 179 ocean beaches (127 miles) and 92% of bay bathing beaches fully support swimming. Of the remaining bay beaches, 2% partially support swimming and 6% do not support the use. Toxics in fish tissue have led to several commercial fishing bans and recreational fish consumption advisories for some species in fresh, tidal, and estuarine waters. Common surface water pollutants include bacteria, nutrients, and current and historical pesticides and industrial chemicals. Sources of pollution to New Jersey's waters include effluent; combined sewers, stormwater, and runoff; construction; historical contamination; and air deposition.

New Jersey did not report on the condition of wetlands.

Ground Water Quality

At present, there is generally an ample supply of good quality ground water in New Jersey. There are, however, problems with ground water quality in some areas. Natural contaminants in some ground waters include radium, radon, iron, sulfate, and hardness. Pollutants include mercury, bacteria, pesticides, and volatile organic compounds (VOCs). Known contamination by industrial and waste disposal activities is being actively managed. Overpumping in some areas contributes to the incidental spread and capture of contaminant plumes and salt water intrusion. Overpumping is being addressed through conservation, source water protection, conjunctive use, and construction of new supplies.

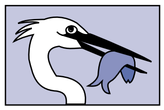
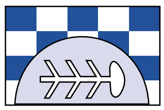
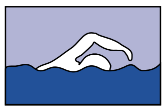
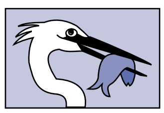
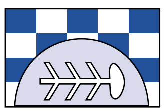
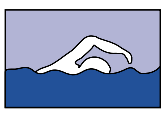
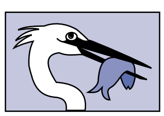
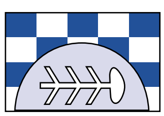
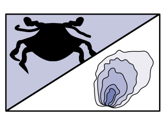
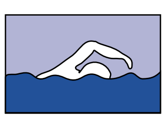
Programs to Restore Water Quality

Through implementation of the National Environmental Performance Partnership System and watershed management, New Jersey continues to develop statewide and watershed-based environmental goals, milestones, and indicators for improvements to water quality. The Performance Partnership Agreement and, in the future, Watershed Management Plans, orients numerous water program strategies toward meeting environmental milestones.

Programs to Assess Water Quality

New Jersey uses benthic macroinvertebrate monitoring to indicate aquatic life designated use support and potential causes of impairment, including nutrients, toxics, and habitat degradation. New Jersey began implementing a redesigned chemical monitoring program that combines broad-scale, long-term monitoring with intensive, site-specific monitoring. Shellfish beds are assessed based on recent water quality data and field surveys of pollutant sources. These assessments are reflected in annual regulatory updates of shellfish harvest areas. Emergency closures of shellfish waters are made as needed based on water quality data. Ocean and bay bathing beaches are also closed as needed based on very extensive monitoring for bacterial contamination. In addition, New Jersey recently formed a Water Assessment Team to enhance data assessment capabilities.

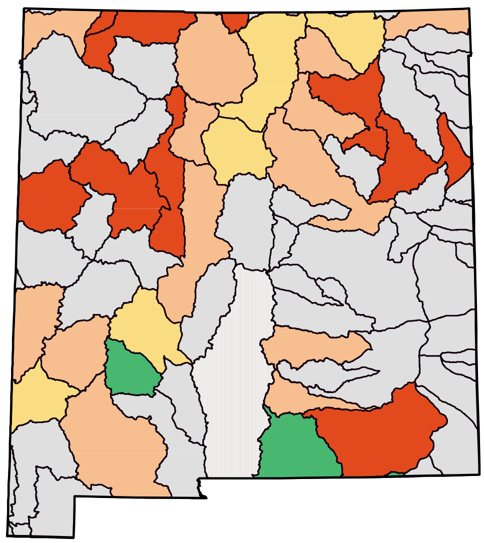
Individual Use Support in New Jersey

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 6,450)[b]	Total Miles Assessed					
	3,815	35	-	52	12	-
	-[c]	-	-	-	-	-
	390	26	-	31	44	-
Lakes (Total Acres = 24,000)	Total Acres Assessed					
	-	-	-	-	-	-
	-[c]	-	-	-	-	-
	-[d]	-	-	-	-	-
Estuaries (Total Square Miles = 0.06)	Total Square Miles Assessed					
	-	-	-	-	-	-
	-[c]	-	-	-	-	-
	614	0	75	18	7	-
	0.06[e]	92	-	2	6	-

Note: Figures may not add to 100% due to rounding.

– Not reported in a quantifiable format or unknown.
[a] A subset of New Jersey's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes intermittent streams.
[c] New Jersey is developing an approach to report its fish advisories in the context of use support.
[d] Lake bathing beach data are being compiled and will be reported in the future.
[e] All estuarine waters are not assessed for recreational uses; however, the state monitors all 138 designated bay beaches and all 127 miles of ocean beaches.

New Mexico



For a copy of the New Mexico 1998 305(b) report, contact:

Gary King
New Mexico Environment Department
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Santa Fe, NM 87502-6110
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Surface Water Quality

About 28% of New Mexico's surveyed stream miles have good water quality that fully supports aquatic life uses. Ninety-nine percent of the surveyed river miles fully support swimming. The leading problems in streams include turbidity, thermal modifications, pathogens, nutrients, and metals. Nonpoint sources are responsible for over 91% of the degradation in New Mexico's 2,435 impaired stream miles. Sources of impairment include agriculture, hydrologic and habitat modification, and recreational activities.

Agriculture and recreational activities are the primary sources of nutrients, siltation, reduced shoreline vegetation, and bank destabilization that impairs aquatic life use in 89% of New Mexico's surveyed lake acres. Mercury contamination from unknown sources appears in fish caught at 23 reservoirs. However, water and sediment samples from surveyed lakes and reservoirs have not detected high concentrations of mercury. Fish may contain high concentrations of mercury in waters with minute quantities of mercury because the process of biomagnification concentrates mercury in fish tissue.

New Mexico did not report on the condition of wetlands.

Ground Water Quality

Approximately 90% of the population of New Mexico depends on ground water for drinking water. The Environment Department has identified at least 1,233 cases of ground water contamination since 1927. The most common source of ground water contamination is small household septic tanks and cesspools. Leaking underground storage tanks, injection wells, landfills, surface impoundments, oil and gas production, mining and milling, dairies, and miscellaneous industrial sources also contaminate ground water in New Mexico. New Mexico operates a ground water discharger permit program that includes ground water standards for intentional discharges and a spill cleanup provision for other discharges.

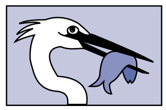
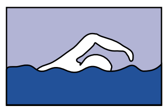
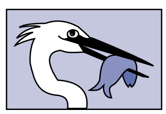
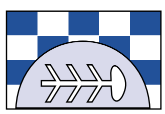
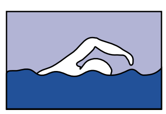
Programs to Restore Water Quality

New Mexico uses a variety of state, federal, and local programs to protect surface water quality. The federal NPDES program is used to protect waters from point source discharges. New Mexico's Nonpoint Source Management Program contains a series of implementation milestones that were designed to establish goals while providing a method to measure progress and success of the program. Implementation consists of the coordination of efforts among NPS management agencies, promotion and implementation of best management practices, coordination of watershed projects, inspection and enforcement activities, consistency reviews, and education and outreach activities.

Programs to Assess Water Quality

New Mexico uses a wide variety of methods to assess its water quality. Second-party data including dischargers' reports, published literature, data stored in EPA's database, as well as data generated by the U.S. Geological Survey are routinely reviewed. The New Mexico Environment Department generates large amounts of data through intensive surveys, assessment of citizen complaints, special studies aimed at areas of special concern (e.g., mercury concentration in water, sediments, and fish), short- and long-term nonpoint source pollution monitoring, TMDL investigations, and effluent monitoring. Special stream surveys conducted in 1996 and 1997 focused on the Gila and Pecos watersheds. These surveys are usually timed to coincide with annual periods of stress for aquatic life (e.g., low flows) and usually include benthic macroinvertebrate assessments to evaluate the integrity of aquatic communities.

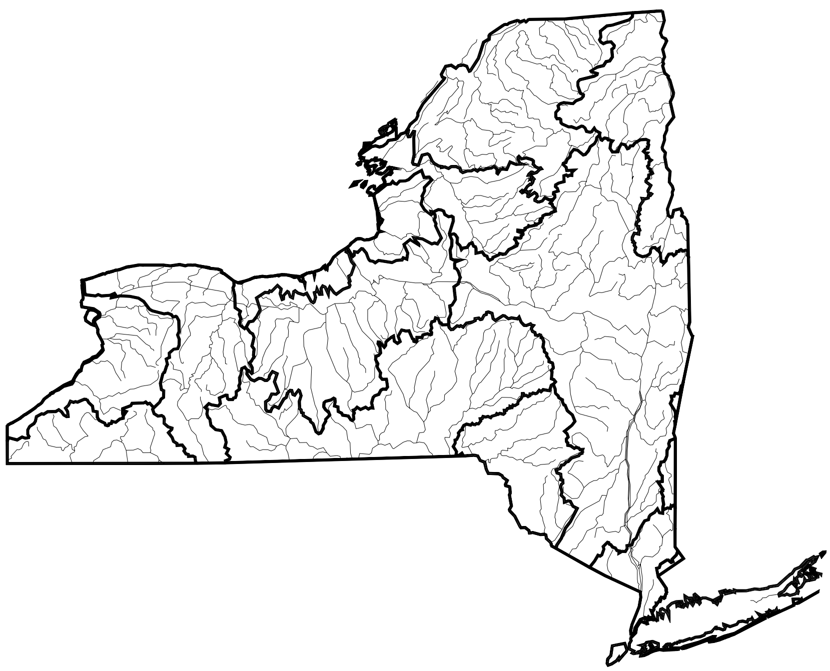
Individual Use Support in New Mexico

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 110,741)[b]	Total Miles Assessed					
	3,995	28	-	33	39	0
	93	0	-	100	0	0
	4,134	99	-	<1	<1	0
Lakes (Total Acres = 997,467)	Total Acres Assessed					
	124,827	11	-	89	<1	0
	109,909	<1	-	100	0	0
	-	-	-	-	-	-

– Not reported in a quantifiable format or unknown.
[a] A subset of New Mexico's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

New York



Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the New York 1998 305(b) report, contact:

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Surface Water Quality

Ninety-nine percent of New York's rivers and streams, 95% of the state's lake acres, all of the state's Great Lakes shoreline, and 99% of the bays and tidal waters have good water quality that fully supports aquatic life uses. Swimming is fully supported in over 99% of rivers, 87% of lakes, 94% of the Great Lakes shoreline, and more than 93% of estuarine waters. Sixty-five percent of New York's Great Lake's shoreline does not fully support fish consumption use because of a fish consumption advisory.

Agriculture is a major source of nutrients and silt that impair New York's rivers, lakes, and reservoirs. Land disposal, hydrologic modification, and habitat modification are also major sources of water quality impairment in rivers and lakes. Urban runoff is a major source of pollution in the state's estuaries. Bacteria from urban runoff and other sources close about 104,000 acres (11%) of potential shellfishing beds in the New York City-Long Island region.

Contaminated sediments are a primary source of impaired rivers, lakes, Great Lake's shoreline, and estuarine waters in New York State. Sediments are contaminated with PCBs, chlorinated organic pesticides, mercury, cadmium, mirex, and dioxins that bioconcentrate in the food chain and result in fish consumption advisories.

Improvements to industrial and municipal discharges have had a significant impact on water quality. Since 1972, the size of rivers impacted by point sources has declined from about 2,000 miles to 230 miles.

New York did not report on the condition of wetlands.

Ground Water Quality

Approximately 6 million people in New York State use ground water as a source of drinking water. The state reports that 312 wells or springs statewide have been contaminated to some degree by organic pollutants. About 3% of the state's public water supply system wells (160 wells) are closed or abandoned due to contamination from organic chemicals. The most common contaminants are synthetic solvents and degreasers, gasoline and other petroleum products, and agricultural pesticides and herbicides (primarily aldicarb and carbofuran). The most common sources of contaminants include spills, septic systems, landfills, and abandoned hazardous waste sites.

Programs to Restore Water Quality

New York's nonpoint source control program depends on the cooperation of many individuals, groups, and agencies to make it work. The Nonpoint Source Coordinating Committee is composed of 17 federal, state, and local agencies that meet regularly to communicate, cooperate, and coordinate New York State's nonpoint source program. Coordination at the local level takes place through county committees composed of local agencies, representatives from state and federal agencies, and public interest groups.

Programs to Assess Water Quality

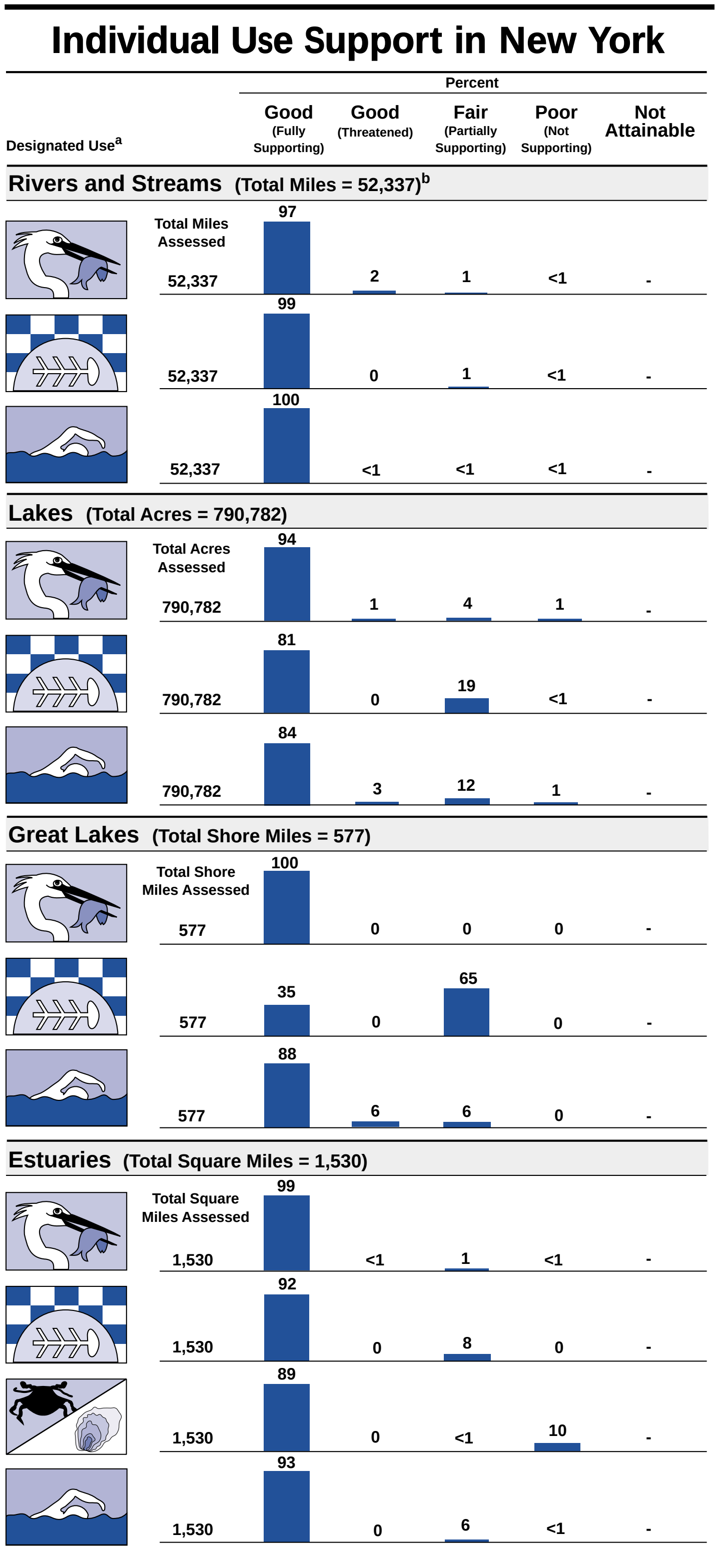
In 1987, New York State implemented the Rotating Intensive Basin Studies (RIBS), an ambient monitoring program that concentrates monitoring activities on one-third of the state's hydrologic basins for 2-year periods. The DEC monitors the entire state every 6 years. The RIBS strategy employs a tiered approach in which rapid biological screening methods are applied at a large number of sites during the first year of a 2-year study, and more intensive chemical monitoring is used to follow up the results of this biological effort in the second year.

– Not reported in a quantifiable format or unknown.

[a] A subset of New York's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

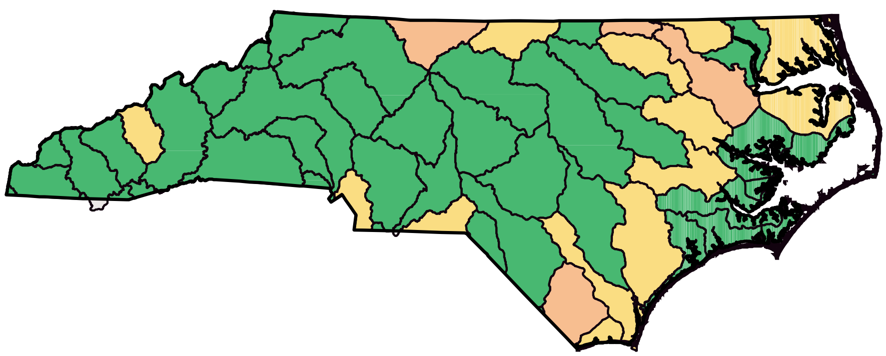
Individual Use Support in New York



Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 52,337)[b]	Total Miles Assessed					
	52,337	97	2	1	<1	-
	52,337	99	0	1	<1	-
	52,337	100	<1	<1	<1	-
Lakes (Total Acres = 790,782)	Total Acres Assessed					
	790,782	94	1	4	1	-
	790,782	81	0	19	<1	-
	790,782	84	3	12	1	-
Great Lakes (Total Shore Miles = 577)	Total Shore Miles Assessed					
	577	100	0	0	0	-
	577	35	0	65	0	-
	577	88	6	6	0	-
Estuaries (Total Square Miles = 1,530)	Total Square Miles Assessed					
	1,530	99	<1	1	<1	-
	1,530	92	0	8	0	-
	1,530	89	0	<1	10	-
	1,530	93	0	6	<1	-

Note: Figures may not add to 100% due to rounding.

North Carolina



Percent of Assessed Rivers, Lakes, and Estuaries Meeting All Designated Uses

- 80% - 100% Meeting All Uses
- 50% - 79% Meeting All Uses
- 20% - 49% Meeting All Uses
- 0% - 19% Meeting All Uses
- Insufficient Assessment Coverage
- Basin Boundaries (USGS 8-Digit Hydrologic Unit)

For a copy of the North Carolina 1998 305(b) report, contact:

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Division of Water Quality
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Surface Water Quality

About 87% of the state's assessed fresh water rivers and streams have good water quality that fully supports designated uses, while 14% are impaired for one or more uses. The major sources of impairment are agriculture, urban runoff, and construction. These sources generate siltation, bacteria, and organic wastes that deplete dissolved oxygen.

Only 2% of the assessed lakes in North Carolina are impaired for aquatic life use. A few lakes are impacted by dioxin, metals, and excessive nutrient enrichment.

About 94% of the estuaries and sounds in North Carolina fully support designated uses. Agriculture, urban runoff, septic tanks, and point source discharges are the leading sources of nutrients, bacteria, and low dissolved oxygen that degrade estuaries.

Ground Water Quality

About half of the people in North Carolina use ground water as their primary supply of drinking water. Ground water quality is generally good. The leading source of ground water contamination is leaking underground storage tanks, which contaminate ground water with gasoline, diesel fuel, and heating oil. Comprehensive programs are under way to assess potential contamination sites and develop a ground water protection strategy for the state.

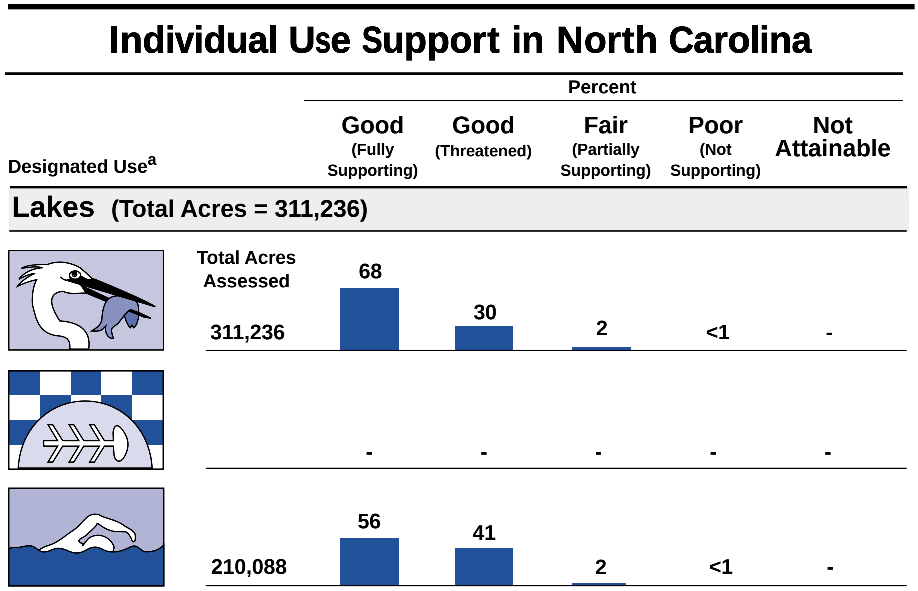
Programs to Restore Water Quality

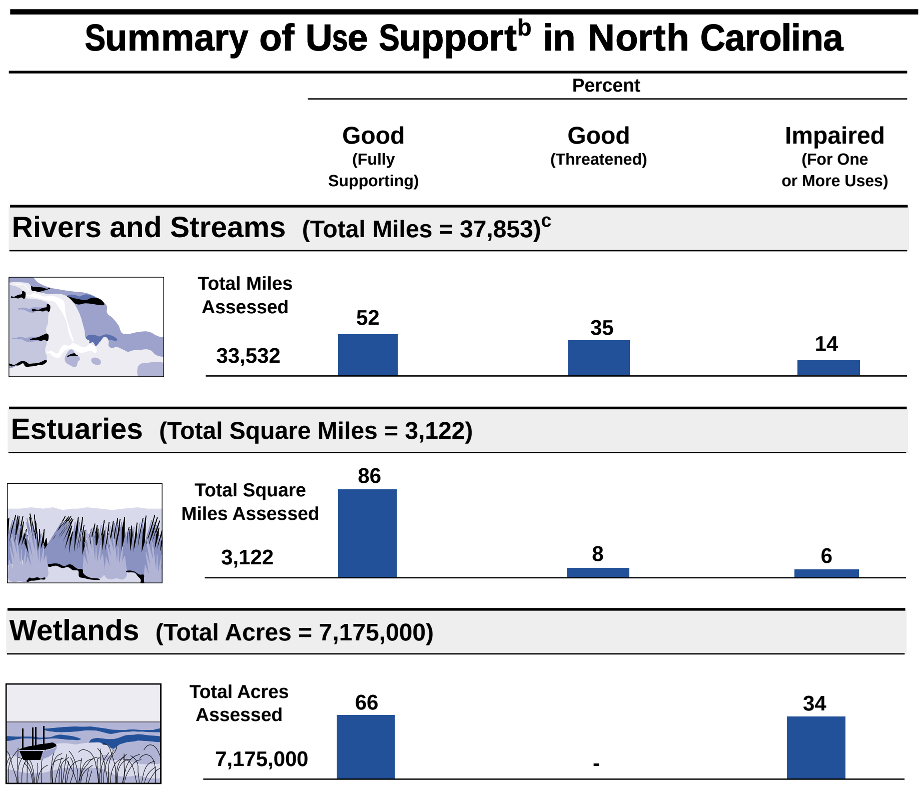
North Carolina takes a watershed level approach to address water quality problems. In 1998, NC Division of Water Quality (DWQ) completed its first set of basinwide management plans, which summarize water quality and develop strategies for addressing problems for each of 17 river basins. Through the Unified Watershed Assessment process, North Carolina's DWQ identified 23 high-priority watersheds in need of restoration. Within these areas, 11 smaller catchments that are biologically impaired will be studied intensively to identify causes and sources of pollution and develop strategies to restore aquatic system health.

Addressing nonpoint source pollution continues to be a priority for North Carolina. The DWQ has begun implementing rules that address nitrogen pollution from urban areas, agriculture, and fertilizer application across the entire Neuse River basin. In addition, a temporary rule is being implemented in the Neuse basin that protects riparian buffers adjacent to all perennial and intermittent streams, ponds, lakes, and estuaries. A similar program for the Tar-Pamlico River basin is currently being developed.

Programs to Assess Water Quality

Surface water quality in North Carolina was primarily evaluated using physical and chemical data collected by the DWQ from a statewide fixed-station network and biological assessments. These include macroinvertebrate (aquatic insect) community surveys, fish community structure analyses, phytoplankton analyses, bioassays, and limnological review of lakes and watersheds. Other sources of information were point source monitoring data, shellfish closure reports, lake trophic state studies, and reports prepared by other local, state, and federal agencies.





Note: Figures may not add to 100% due to rounding.

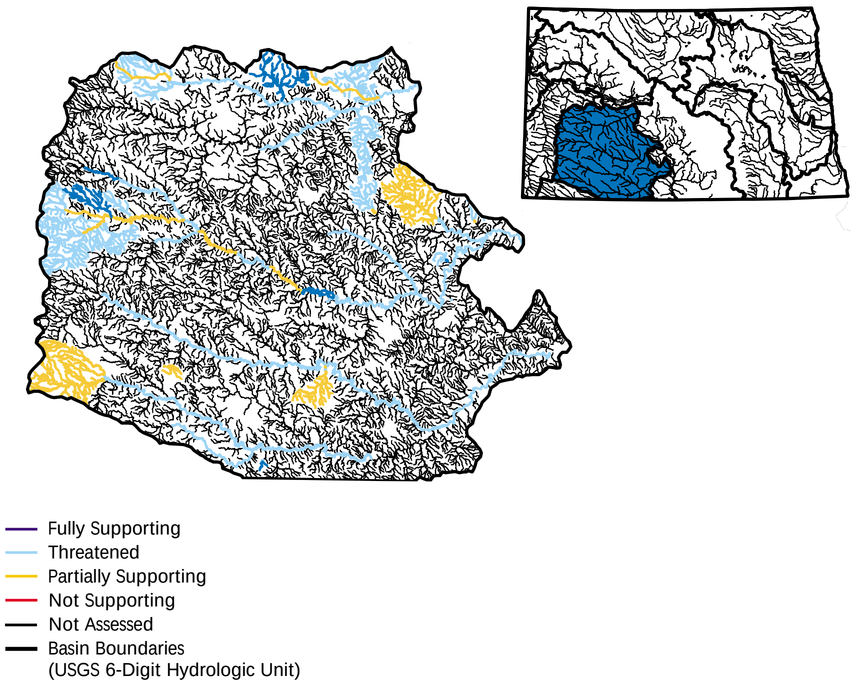
– Not reported in a quantifiable format or unknown.

[a] A subset of North Carolina's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] A summary of use support data is presented because North Carolina did not report individual use support in rivers and estuaries in their 1998 Section 305(b) report.

[c] Includes nonperennial streams that dry up and do not flow all year.

North Dakota



This map depicts aquatic life use support status.

For a copy of the North Dakota 1998 305(b) report, contact:

Michael Ell
North Dakota Department of Health
Division of Water Quality
P.O. Box 5520
Bismark, ND 58506-5520
(701) 328-5214
e-mail: mell@state.nd.us

The report is also available on the Internet at: *http://www.health.state.nd.us/ndhd/environ/wq/index/htm*

Surface Water Quality

North Dakota reports that 71% of its assessed rivers and streams have good water quality that fully supports aquatic life uses now, but good conditions are threatened in most of these streams. Sixty-seven percent of the assessed streams fully support swimming. Siltation, nutrients, pathogens, oxygen-depleting wastes, and habitat alterations impair aquatic life use support in 29% of the surveyed rivers and impair swimming in over 32% of the surveyed rivers. The leading sources of contamination are agriculture, drainage and filling of wetlands, hydromodification, and upstream impoundments. Natural conditions, such as low flows caused by water regulation, also contribute to aquatic life use impairment.

In lakes, 96% of the surveyed acres have good water quality that fully supports aquatic life uses, and 85% of the surveyed acres fully support swimming. Siltation, nutrients, metals, and oxygen-depleting substances are the most widespread pollutants in North Dakota's lakes. The leading sources of pollution in lakes are agricultural activities (including nonirrigated crop production, pasture land, and confined animal operations), urban runoff/storm sewers, hydromodification, and habitat modification. Natural conditions also prevent some waters from fully supporting designated uses.

Ground Water Quality

North Dakota has not identified widespread ground water contamination, although some naturally occurring compounds may make the quality of ground water undesirable in a few aquifers. Where human-induced ground water contamination has occurred, the impacts have been attributed primarily to petroleum storage facilities, agricultural storage facilities, feedlots, poorly designed wells, abandoned wells, wastewater treatment lagoons, landfills, septic systems, and the underground injection of waste. Assessment and protection of ground water continue through ambient ground water quality monitoring activities, the implementation of wellhead protection projects, the Comprehensive Ground Water Protection Program, and the development of a State Management Plan for Pesticides.

Programs to Restore Water Quality

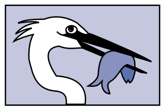
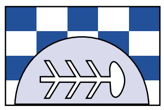
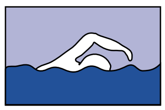
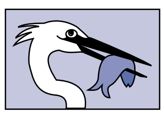
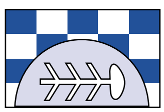
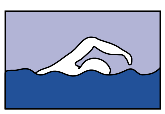
North Dakota's Nonpoint Source Pollution Management Program has provided financial support to 50 projects since 1990. Although the size, type, and target audience of these projects vary, the projects share the same basic goals: (1) increase public awareness of nonpoint source pollution, (2) reduce or prevent the delivery of NPS pollutants to waters of the state, and (3) disseminate information on effective solutions to NPS pollution.

Programs to Assess Water Quality

The North Dakota Department of Health monitors physical and chemical parameters (such as dissolved oxygen, pH, total dissolved solids, nutrients, and toxic metals), toxic contaminants in fish, whole effluent toxicity, and fish and macroinvertebrate community structure. North Dakota's ambient water quality monitoring network consists of 27 sampling sites on 24 rivers and streams. The Department's biological assessment program has grown since 1993. Currently, biosurveys are conducted at approximately 50 sites each year.

North Dakota is developing biological assessment methods and criteria for depressional and riparian wetlands.

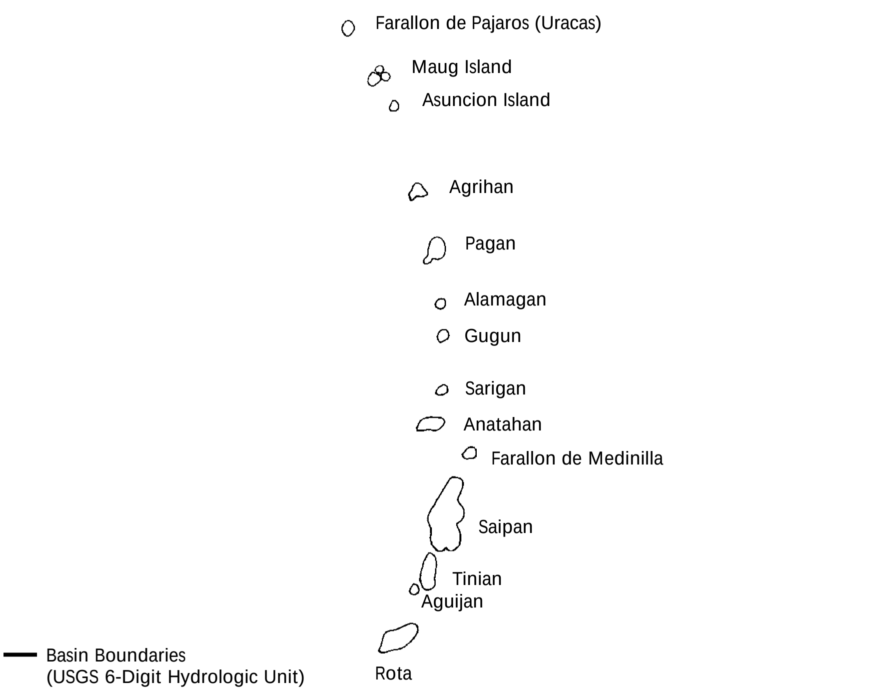
Individual Use Support in North Dakota

Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 54,373)[b]	Total Miles Assessed					
	11,866	9	62	26	3	0
	147	0	0	100	0	0
	8,842	16	51	30	2	-
Lakes (Total Acres = 660,097)	Total Acres Assessed					
	640,591	24	72	4	0	-
	464,319	0	0	100	0	-
	625,591	22	63	16	0	-

[a] A subset of North Dakota's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Commonwealth of the Northern Mariana Islands



For a copy of the Commonwealth of the Northern Mariana Islands 1998 305(b) report, contact:

Ike Cabrera
Commonwealth of the Northern Mariana Islands
Division of Environmental Quality
P.O. Box 1304
Saipan, MP 96950
(670) 664-8500

Surface Water Quality

The Commonwealth of the Northern Mariana Islands (CNMI) is an archipelago of 15 islands in the Western Pacific Ocean located north of Guam. The largest and most populated of the Islands is Saipan with an area of 120 square kilometers and 52 miles of coastline. Currently, the majority of the monitoring of surface and ground waters takes place on Saipan, but future efforts will work to include the other islands.

The streams and wetlands on CNMI are not currently monitored because they are not used for drinking water or recreation. Coastal marine waters are monitored because the quality of the water can affect the health of the coral reef ecosystem, on which subsistence, recreation, storm protection, and tourism depend.

Both point and nonpoint sources are responsible for lowering the quality of CNMI's water. Sewage outfalls, dredging, sedimentation from unpaved roads and development, and nutrients from golf courses and agriculture are the most significant stressors on the CMNI's marine water quality. The sediment and nutrients are the most detrimental to the health of the coral reefs and are the two most significant causes of marine water quality impairment in the CMNI.

CNMI did not report on the condition of wetlands.

Ground Water Quality

Ninety-nine percent of the drinking water on the islands comes from aquifers. With an expected population increase of 40% by 2000, protecting the aquifers for present and future uses is a high priority. Greater demands for water have already led to overpumping of the aquifer. Overpumping can lead to high levels of chlorides in the water and eventually to salt water intrusion, an irreversible condition that causes permanent damage to the aquifer. Ground water quality is also threatened from industry (garment factories), failing septic systems, and service industries (gas stations, repair shops, and power generators). In addition, there is also concern about historical contamination from resulting from military activities from 1940 to the 1960s.

Programs to Restore Water Quality

Permits are required for all water wells in the CNMI. The permits require semiannual water sample results on chlorides, fecal coliform bacteria, and other potential contaminants. Along with the permits, pumping rates for new wells and for existing wells with increased chloride levels are decreased. A fairly stringent permitting program is also in place for new septic tank construction and, at the same time, funding is being sought to extend existing sewer lines into highly populated areas. Underground and aboveground storage tanks must be reviewed and approved before installation. Chemical storage is controlled by permitting and inspection of storage facilities.

Programs to Assess Water Quality

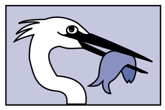
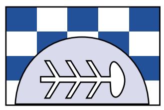
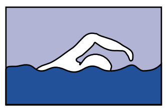
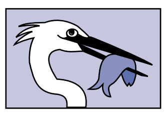
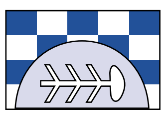
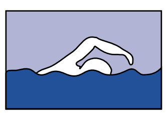
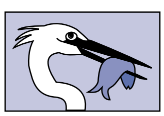
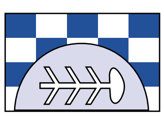
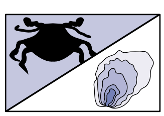
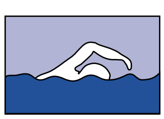
CNMI's Department of Environmental Quality has an extensive monitoring program that includes monitoring public water supply systems and nearshore marine water for traditional water quality parameters. Biocriteria methods are used to monitor the health of coral reefs.

Although the extent of contamination caused by World War II activities on the islands has not been fully investigated, an area of particular concern, the Puerto Rico dump, has been found to be in violation of the Clean Water Act. As part of a dump closure plan, an independent firm will be contracted to monitor and evaluate the site and the water quality surrounding the dump.

[a] A subset of CNMI's designated uses appear in this figure. Refer to the commonwealth's 305(b) report for a full description of the commonwealth's uses.

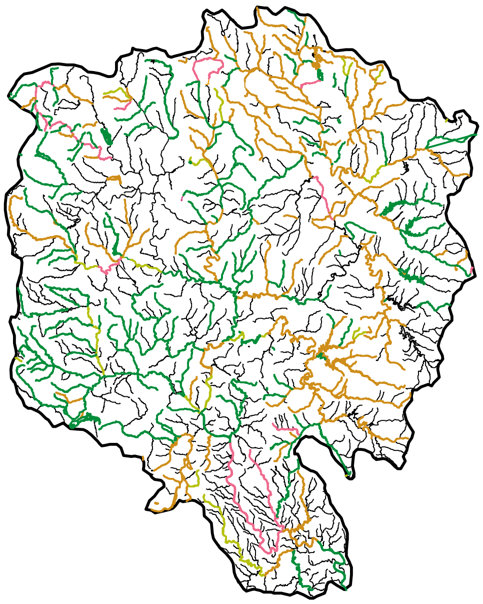
[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Northern Mariana Islands

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 59)[b]	Total Miles Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Estuaries (Total Square Miles = 15,975)	Total Square Miles Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Ocean Shoreline (Total Shore Miles = 52)	Total Shore Miles Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	1	0	0	0	100	-

Note: Figures may not add to 100% due to rounding.

Ohio



This map depicts aquatic life use support status.

For a copy of the Ohio 1996 305(b) report, contact:

Ed Rankin
Ohio Environmental Protection Agency
Division of Surface Water
1685 Westbelt Drive
Columbus, OH 43228
(614) 728-3388
e-mail: Ed.Rankin@epa.state.oh.us

Surface Water Quality

For the 1998 reporting cycle, Ohio provided an addendum to the state's 1996 305(b) report, focusing on aquatic life use support assessments performed during 1996 and 1997. Of the 3,023 river miles assessed for aquatic life use during this time period, 57% were fully supporting, 20% were partially supporting, and 22% were not supporting. The state identified habitat alterations, organic enrichment, siltation, metals, flow alterations, and nutrients as the major causes of aquatic life use impairment. The leading sources of aquatic life use impairment include hydrologic modifications, point sources, agriculture, mining, and urban runoff.

In the state's 1998 report, Ohio for the first time presented narrative ranges of biological integrity for rivers and streams. Ohio has narrative ratings that are matched to the state's aquatic life uses. Nearly 20% of the assessed streams were rated as excellent, indicating a high species richness and diversity of fish and macroinvertebrate assemblages. Thirty-nine percent were rated as good, indicating a well-balanced community of fish and macroinvertebrates comparable to reference conditions. Just under 26% were rated as fair, indicating that one or more organism groups deviate moderately from reference conditions. Fourteen percent were rated as poor, indicating situations where one or more organism groups deviates substantially from reference conditions. Only 2% of streams were classified as very poor, indicating a virtual absence of any aquatic life.

Ground Water Quality

About 4.5 million Ohio residents depend on wells for domestic water. Waste disposal activities, underground storage tank leaks, and spills are the dominant sources of ground water contamination in Ohio.

Programs to Restore Water Quality

Ohio is reworking its Nonpoint Source Management Plan by forming a number of working groups, such as the headwater streams working group, that involve multiple agencies and other interested parties. These groups are charged with developing strategies with the ultimate goal of protecting Ohio's rivers and streams.

To fully restore water quality, Ohio EPA advocates an ecosystem approach that confronts degradation on shore as well as in the water. Ohio's programs aim to correct nonchemical impacts, such as channel modification and the destruction of shoreline vegetation.

Programs to Assess Water Quality

Ohio pioneered the integration of biosurvey data, physical habitat data, and bioassays with water chemistry data to measure the overall integrity of water resources. Biological monitoring provides the foundation of Ohio's water programs because traditional chemical monitoring alone may not detect episodic pollution events or nonchemical impacts. Ohio EPA found that biosurvey data can increase the detection of aquatic life use impairment by about 35% to 50%.

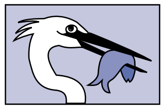
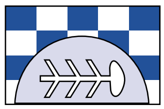
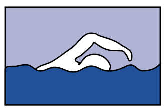
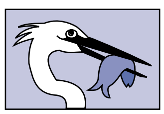
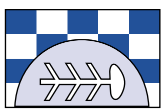
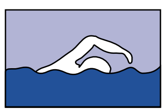
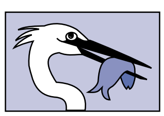
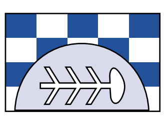
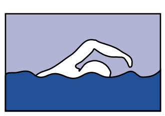
Ohio is developing biological assessment methods and criteria for depressional and riparian wetlands.

– Not reported in a quantifiable format or unknown.

[a] A subset of Ohio's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

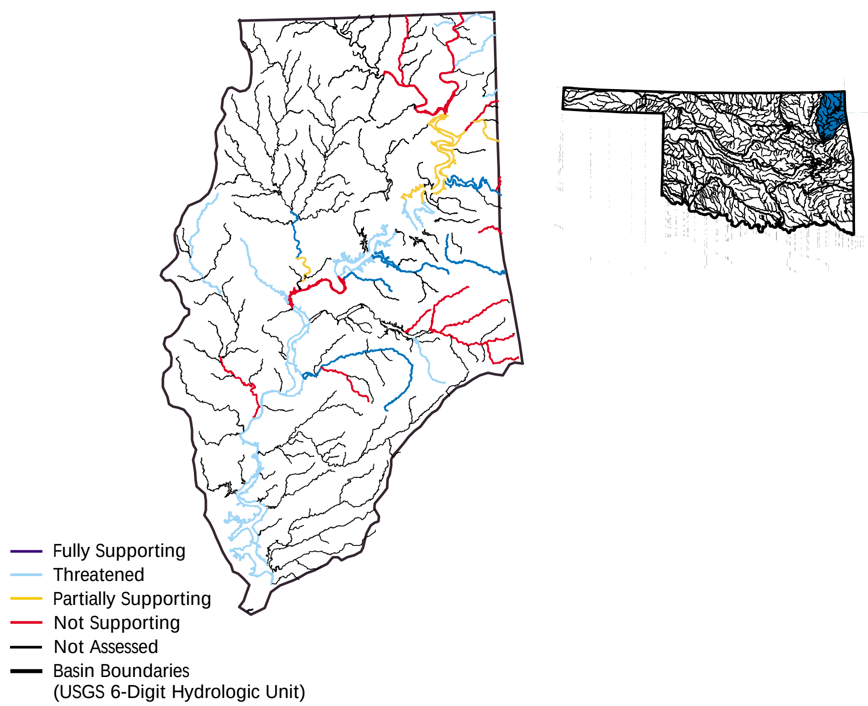
[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Ohio

Designated Use[a]	Total Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 29,113)[b]	Total Miles Assessed					
	3,023	46	11	20	22	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Lakes (Total Acres = 188,461)	Total Acres Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Great Lakes (Total Shore Miles = 236)	Total Shore Miles Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

Note: Figures may not add to 100% due to rounding.

Oklahoma



This map depicts aquatic life use support status.

For a copy of the Oklahoma 1998 305(b) report, contact:

Shelly Carter
Oklahoma Department of
Environmental Quality
Water Quality Division
P.O. Box 1677
Oklahoma City, OK 73101-1677
(405) 702-8198
e-mail: karen.carter@deqmail.state.ok.us

Surface Water Quality

Thirty-seven percent of the assessed river miles have good water quality that fully supports aquatic life uses and 61% fully support swimming. The most common pollutants found in Oklahoma rivers are siltation, pesticides, nutrients, and suspended solids. Agriculture is the leading source of pollution in the state's rivers and streams, followed by resource extraction and hydrologic and habitat modifications.

Fifty-six percent of the assessed lake acres fully support aquatic life uses and more than 59% fully support swimming. The most widespread pollutants in Oklahoma's lakes are siltation, nutrients, suspended solids, pesticides, and oxygen-depleting substances. Agriculture is also the most common source of pollution in lakes, followed by hydrologic modifications and resource extraction. Several lakes are impacted by acid mine drainage, including the Gaines Creek arm of Lake Eufaula and the Lake O' the Cherokees.

Oklahoma did not report on the condition of wetlands.

Ground Water Quality

Ambient ground water monitoring has detected elevated nitrate concentrations in monitoring wells scattered across the state. Monitoring has also detected isolated cases of hydrocarbon contamination, elevated selenium and fluoride concentrations (some due to natural sources), chloride contamination from discontinued oil field activities, metals from past mining operations, and gross alpha activity above maximum allowable limits. Industrial solvents contaminate a few sites around Tinker Air Force Base. The state rates agricultural activities, injection wells, septic tanks, surface impoundments, and underground storage tanks among the highest priority sources of ground water contamination.

Programs to Restore Water Quality

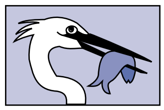
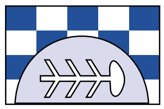
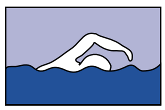
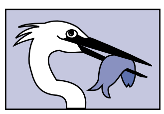
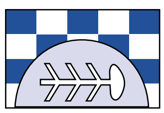
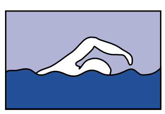
Oklahoma's nonpoint source control program is a cooperative effort of state, federal, and local agencies with the Conservation Commission serving as the lead technical agency. The program sponsors best management practices, water quality monitoring before and after BMP implementation, technical assistance, education, and development of comprehensive watershed management plans. The Conservation Commission is working toward a goal of 70% cooperative participation by local landowners in BMP projects.

Programs to Assess Water Quality

The Oklahoma Department of Environmental Quality monitors the waters of the state for toxic contaminants through the Ambient/Biotrend Monitoring and Toxic Monitoring in Reservoirs programs. The Ambient/Biotrend Monitoring program consists of 22 core and 78 rotating stations and has been in place since 1979. The Toxic Monitoring in Reservoirs program began in 1980 and has involved monitoring of over 50 different lakes in the state. Oklahoma also participates in the EPA Region 6 Ambient Biotoxicity Network that began sampling in 1990.

The Oklahoma Water Quality Monitoring Council (OWQMC) was created in the fall of 1997 to develop and implement a comprehensive state water quality monitoring strategy. The OWQMC organization fosters cooperation among groups involved in all types of water quality monitoring and associated mapping activities.

Individual Use Support in Oklahoma

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 78,778)[b]	Total Miles Assessed					
	11,088	13	24	15	48	-
	-	-	-	-	-	-
	4,682	15	46	24	15	-
Lakes (Total Acres = 1,041,884)	Total Acres Assessed					
	606,066	21	35	38	5	-
	-	-	-	-	-	-
	547,972	9	50	35	6	-

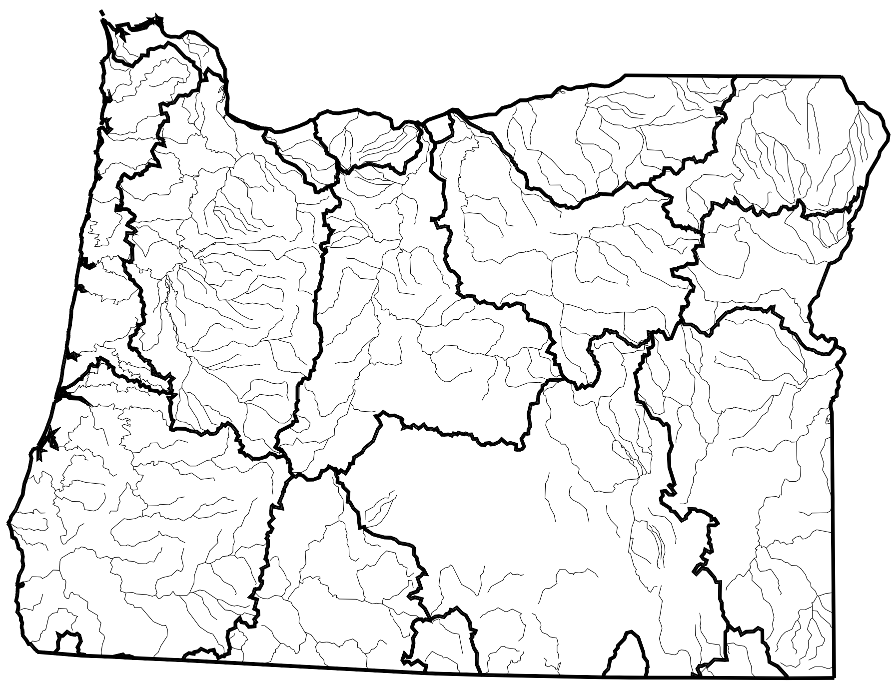
– Not reported in a quantifiable format or unknown.

[a] A subset of Oklahoma's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Oregon



For a copy of the Oregon 1998 305(b) report, contact:

Dick Pedersen
Oregon Department of Environmental Quality
Water Quality Division
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-6345
email: pedersen.dick@deq.state.or.us

The report is also available on the Internet at: *http://www.deq.state.or.us/wq/305bRpt/305bReport.htm*

Surface Water Quality

Seventy-four percent of Oregon's surveyed rivers have good water quality that fully supports aquatic life use. The most commonly reported problems in the state's streams include thermal modifications, pathogens, and habitat alterations. Suspected sources include agriculture, silviculture, and habitat and hydromodifications.

In lakes, 35% of the surveyed acres fully support aquatic life uses. Common problems in Oregon's lakes include nutrients, acidity, organic enrichment, and metals. Agriculture, natural sources, and urban runoff/storm sewers are the most commonly reported sources of lake impairment.

Ninety-three percent of Oregon's surveyed estuarine waters partially support shellfishing use due to periodic violations of bacteria standards. Suspected sources of bacteria include municipal and industrial point sources, agriculture, collection system failures, and urban runoff/storm sewers.

In Oregon, 13,687 river miles and 30 lakes do not meet state water quality standards and are listed on the Water Quality Limited Waterbodies 303(d) list. Although the list is significantly larger than in the past, the increase does not signify that Oregon's waters are more degraded than a few years ago. The increase simply reflects the amount of new information considered in developing the list.

Oregon did not report on the condition of wetlands.

Ground Water Quality

Oregon has two ground water management areas and is studying ground water quality in several other areas of the state. Contaminants of concern include pesticides, petroleum compounds, metals, and halogenated solvents. Suspected sources of contamination include agricultural activities, above- and below-ground storage tanks, landfills, septic systems, hazardous waste sites, spills, and urban runoff.

Programs to Restore Water Quality

The Department of Environmental Quality (DEQ) is the state agency responsible for protecting Oregon's public water for a wide range of uses. DEQ sets water quality standards to protect "beneficial uses" such as recreation, fish habitat, drinking water supplies, and aesthetics. DEQ is now beginning a 10-year process of developing Total Maximum Daily Loads for those waterbodies that appear on the state's 303(d) list.

DEQ regulates approximately 587 municipal wastewater sewage treatment plants and 223 industrial dischargers through individual permits that set limits on pollutants discharged. In addition, approximately 1,310 facilities have general permits that limit discharges and 1,410 facilities are covered by stormwater general permits. DEQ also permits and inspects septic system installations.

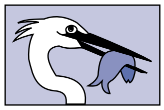
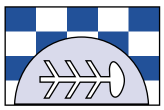
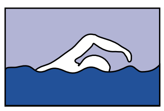
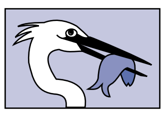
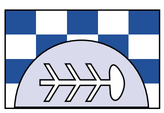
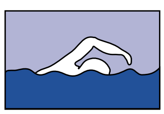
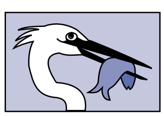
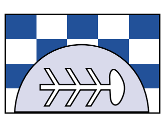
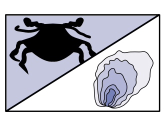
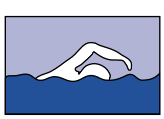
Programs to Assess Water Quality

DEQ monitors water quality with regular sampling of more than 50 rivers and streams in the 18 designated river basins in Oregon. This sampling produces conventional pollutant data for determining trends, standards compliance, and problem identification. Biological monitoring is also conducted under one of three sampling strategies: probabilistic sampling for extrapolation of conditions of study units (e.g., ecoregion), best management practices effectiveness monitoring, and reference site monitoring. Other monitoring includes studies of mixing zones at effluent discharges, volunteer monitoring, and sampling of shellfish areas for bacteria.

– Not reported in a quantifiable format or unknown.

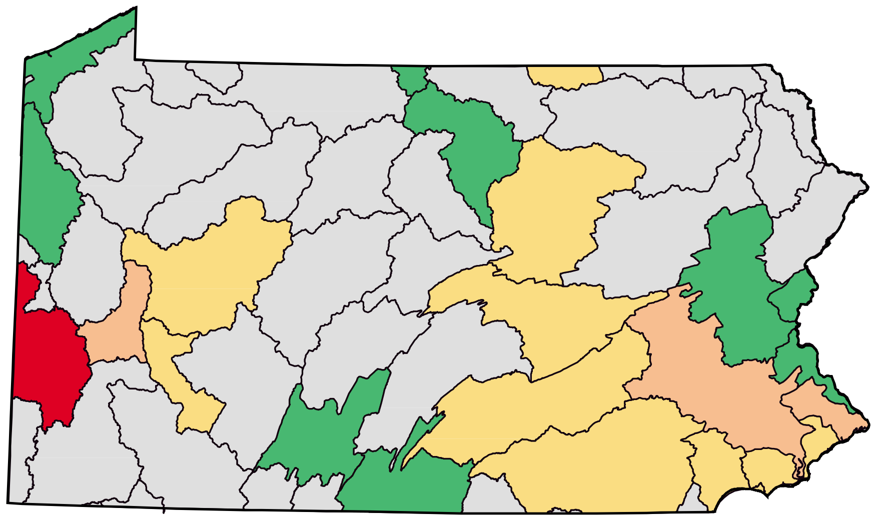
[a] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Oregon

Designated Use	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 114,823)[a]	Total Miles Assessed					
	53,735	30	44	0	26	-
	984	9	10	0	81	-
	5,026	55	1	0	44	-
Lakes (Total Acres = 618,934)	Total Acres Assessed					
	132,299	<1	35	0	65	-
	30,820	0	31	0	69	-
	23,699	8	59	0	33	-
Estuaries (Total Square Miles = 206)	Total Square Miles Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	56	7	0	93	0	0
	25	100	0	0	0	-

Note: Figures may not add to 100% due to rounding.

Pennsylvania



Percent of Assessed Rivers, Lakes, and Estuaries Meeting All Designated Uses

- 80% - 100% Meeting All Uses
- 50% - 79% Meeting All Uses
- 20% - 49% Meeting All Uses
- 0% - 19% Meeting All Uses
- Insufficient Assessment Coverage
- Basin Boundaries (USGS 8-Digit Hydrologic Unit)

For a copy of the Pennsylvania 1998 305(b) report, contact:

Robert Frey
Pennsylvania Department of Environmental Protection
Bureau of Watershed Conservation
Division of Water Quality Assessment and Standards
P.O. Box 8555
Harrisburg, PA 17105-8555
(717) 787-9637
e-mail: frey.robert@dep.state.pa.us

The report is also available on the Internet at: *http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/wqstandards.htm*

Surface Water Quality

Nearly 66% of the surveyed river miles have good water quality that fully supports aquatic life uses. The most widespread pollutants impairing the remaining miles are metals, which impact over 1,610 miles. Other pollutants include suspended solids, nutrients, and organic enrichment.

Abandoned mine drainage is the most significant source of surface water quality degradation. Drainage from abandoned mining sites pollutes at least 1,764 miles of streams, 40% of all degraded streams. Other sources of degradation include agriculture, urban runoff/storm sewers, and habitat modification.

Pennsylvania has issued fish consumption advisories on 24 waterbodies. Most of the advisories are due to elevated concentrations of PCBs and chlordane in fish tissue, but two advisories have been issued for mirex and one for mercury.

Zebra mussels are present in Pennsylvania in Lake Erie and the immediate vicinity, as well as the lower Monongahela, lower Allegheny, and upper Ohio rivers. There are about 175 publicly and privately run zebra mussel sampling sites statewide.

Ground Water Quality

Major sources of ground water contamination include pesticide application, aboveground and underground storage tanks, surface impoundments, landfills, hazardous waste sites, industrial facilities, mining and mine drainage, pipelines and sewer lines, and spills. Petroleum and petroleum byproducts are the most common pollutants in ground water. Coal mining and oil and gas production have also elevated concentrations of several elements (including chlorides and metals in some regions). Pennsylvania is continuing to develop its Comprehensive State Ground Water Protection Program (CSGWPP). The CSGWPP provides a mechanism for Pennsylvania and EPA to work together to develop a comprehensive and consistent statewide approach to ground water quality protection. Pennsylvania and EPA will use the CSGWPP to focus on a long-term process for improving existing state and federal ground water programs.

Programs to Restore Water Quality

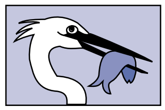
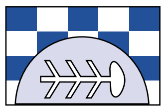
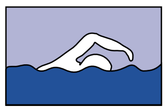
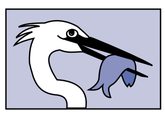
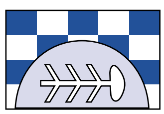
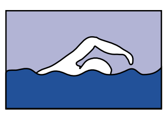
Eliminating acid mine drainage from abandoned mines will require up to $5 billion. The cost, difficulty, magnitude, and extent of the problem have hampered progress. To date, the Commonwealth has funded studies to determine the effectiveness of alternative techniques for treating mine drainage and preventing contamination. The U.S. Office of Surface Mining and EPA Region 3 have created the Appalachian Clean Streams Initiative to address water quality problems associated with mine drainage in Maryland, Ohio, Pennsylvania, and West Virginia. It is hoped that this initiative will involve private organizations and local citizens, as well as government agencies, in moving toward solutions.

Programs to Assess Water Quality

The Water Quality Network monitors chemical and physical parameters almost monthly and biological parameters annually at 153 fixed stations on rivers, streams, and Lake Erie. The Commonwealth also conducts ambient ground water monitoring at 537 monitoring sites.

Biological assessment methods for wetlands are being developed in Pennsylvania with the intention of establishing criteria for wetlands.

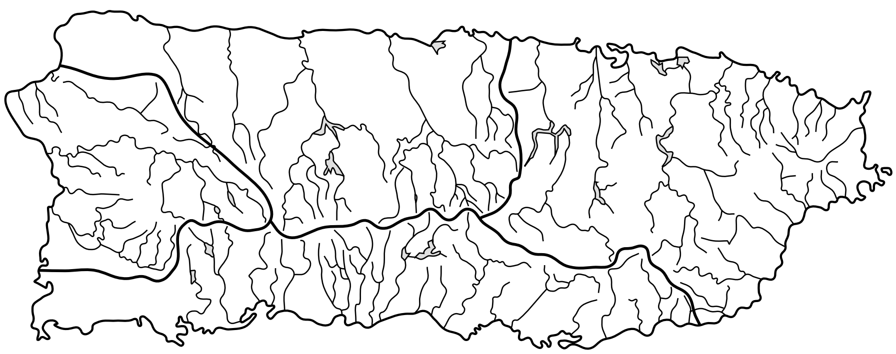
Individual Use Support in Pennsylvania

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 83,260)[b]						
	Total Miles Assessed 12,902	66	-	-	34	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Lakes (Total Acres = 161,445)						
	Total Acres Assessed -	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Pennsylvania's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Puerto Rico



For a copy of the Puerto Rico 1998 305(b) report, contact:

Rubén González
Puerto Rico Environmental Quality Board
Water Quality Area
Box 11488
Santurce, PR 00910
(787) 751-5548

Surface Water Quality

In rivers and streams, 81% of the assessed miles have good water quality that fully supports aquatic life uses, less than 1% partially support aquatic life uses, and 19% do not support aquatic life uses. Swimming is impaired in 20% of the assessed rivers and streams. Pathogens, nonpriority organics, metals, inorganic chemicals, and low dissolved oxygen are the most widespread problems in rivers and streams. In lakes, 18% of the assessed acres fully support aquatic life uses and 82% do not support aquatic life uses. Swimming is impaired in 30% of the surveyed lake acres. Uses are impaired by pathogens, low dissolved oxygen concentrations, and metals. Major sources of impairment to rivers and lakes include land disposal of wastes, urban runoff, agricultural activities, and collection system failures.

Ninety-nine percent of the assessed estuarine waters fully support aquatic life use and 95% fully support swimming use. Metals from land disposal and pathogens from unknown sources are responsible for the impaired miles. Industrial and municipal discharges, collection system failures, spills, marinas, urban runoff, and land disposal of wastes also pollute beaches.

Puerto Rico did not report on the condition of wetlands.

Ground Water Quality

Two wells were closed due to bacterial contamination. Another 10 wells were closed for the following reasons: low yield; contamination by trichloroethylene, nitrates, or volatile organic compounds (VOCs); high salinity levels; turbidity; and residual chlorine. The major sources of ground water contamination include agricultural activities, septic tanks, industrial facilities, storage tanks, and landfills. Puerto Rico adopted ground water use classifications and water quality standards in 1990. During this reporting period, Puerto Rico began the implementation of a ground water monitoring network.

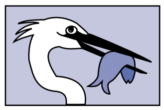
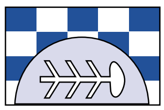
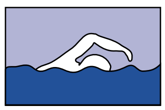
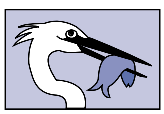
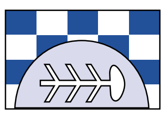
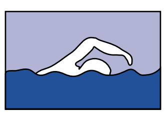
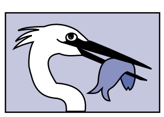
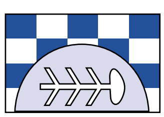
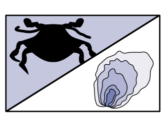
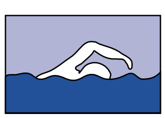
Programs to Restore Water Quality

Puerto Rico requires permits or certificates for ground water and surface water discharges, underground storage tanks, and livestock operations. Certificates require livestock operations to implement animal waste management systems and other best management practices. During this reporting period, Puerto Rico issued 269 certificates for livestock operations. Other nonpoint source control program activities are directed at erosion and sedimentation from construction and mining activities and sewage disposal from small communities.

Programs to Assess Water Quality

The Puerto Rico Environmental Quality Board (PREQB) operates three fixed-station monitoring networks and also performs watershed monitoring on a limited basis. To date, monitoring has been limited to physical and chemical parameters. However, during 1996 the PREQB, along with EPA, approved a Rapid Bioassessment Protocol and began a pilot project to determine the feasibility of implementing it in the near future. Puerto Rico also maintains a Permanent Coastal Water Quality Network of 88 stations and the San Juan Beachfront Special Monitoring Network of 22 stations sampled monthly for bacterial contamination.

Individual Use Support in Puerto Rico

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 5,385)[b]	Total Miles Assessed					
	5,385	14	67	<1	19	0
	-	-	-	-	-	-
	5,385	14	66	<1	20	<1
Lakes (Total Acres = 12,111)	Total Acres Assessed					
	12,111	18	0	0	82	0
	-	-	-	-	-	-
	12,111	70	0	5	25	0
Estuaries (Total Square Miles = 549.9)	Total Square Miles Assessed					
	175	19	80	0	1	0
	-	-	-	-	-	-
	-	-	-	-	-	-
	175	16	79	0	1	4

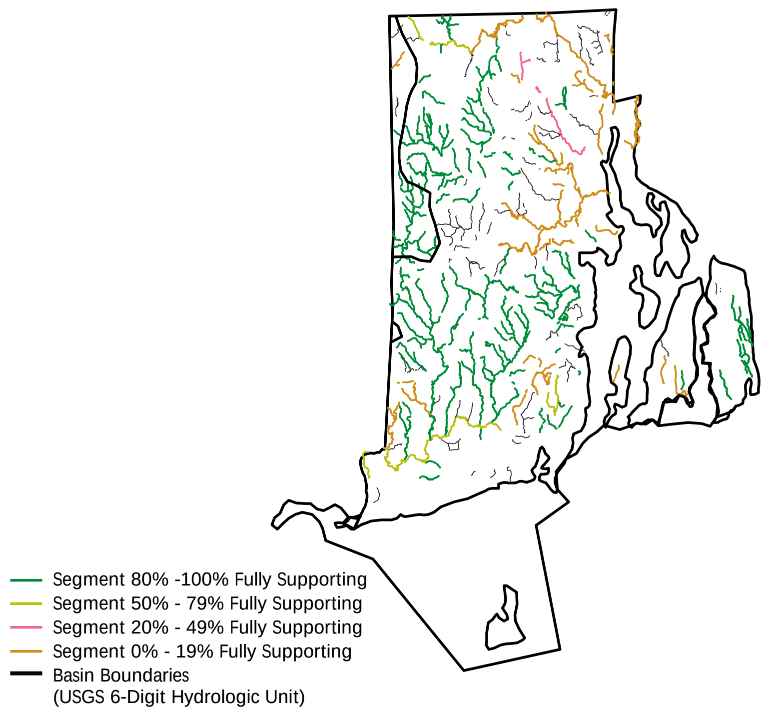
Note: Figures may not add to 100% due to rounding.

– Not reported in a quantifiable format or unknown.

[a] A subset of Puerto Rico's designated uses appear in this figure. Refer to the Commonwealth's 305(b) report for a full description of the Commonwealth's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Rhode Island



This map depicts aquatic life use support status.

For a copy of the Rhode Island 1998 305(b) report, contact:

Connie Carey
Rhode Island Department of
Environmental Management
Office of Water Resources
235 Promenade Street
Providence, RI 02908
(401) 222-3961

Surface Water Quality

Of the river miles assessed, 52% fully support swimming use, and approximately 37% fully support it now but are considered threatened. Approximately 23% fully support aquatic life use and 50% are considered fully supporting but threatened. The most significant causes of nonsupport for rivers are biodiversity impacts, pathogens, metals, and nutrients. Potential sources of nonsupport include both point and nonpoint sources.

Of the lake acres assessed, 70% fully support swimming while 23% are considered fully supporting but threatened. Approximately 43% fully support aquatic life needs and 43% fully support aquatic life uses but are threatened. For lakes and ponds, the major causes of nonsupport are high bacteria, nutrient, and chloride levels. Major sources of nonsupport are mainly from nonpoint source impacts such as urban and stormwater runoff.

In estuarine waters, approximately 77% support swimming uses and 14% fully support them but are considered threatened. Sixty-six percent fully support aquatic life needs while 18% are considered fully supporting but threatened. Seventy-three percent fully support shellfishing use while 6% fully support it but are considered threatened by bacterial contamination, the major impact on designated uses. Nutrients and low dissolved oxygen in the Upper Bay and coves are moderate causes of impairment. Combined sewer overflows are the major source of bacteria contamination. CSOs, urban runoff, and municipal discharges are sources of nutrient enrichment problems in the Upper Bay and coves.

Rhode Island did not report on the condition of wetlands.

Ground Water Quality

About 19% of the state's population gets its drinking water from public and private wells. Overall, Rhode Island's ground water has good to excellent quality, but over 100 contaminants have been detected in localized areas. Thirteen community and eight noncommunity wells have been closed, and over 350 private wells have had contaminant concentrations exceeding drinking water standards. The most common pollutants are petroleum products, certain organic solvents, and nitrates. Significant pollution sources include leaking underground storage tanks, hazardous and industrial waste disposal sites, illegal or improper waste disposal, chemical and oil spills, landfills, septic systems, road salt storage and application, and fertilizer application.

Programs to Restore Water Quality

The focus on water quality has gradually shifted from controlling point sources to controlling nonpoint sources of pollution. Construction of wastewater treatment systems has addressed the majority of the larger direct discharges to the state's waters. As part of the Watershed Approach, the Office of Water Resources (OWR) staff work with local property owners and officials to develop management plans and strategies to identify pollution sources and are involved with the oversite and performance evaluation of special water quality projects.

Programs to Assess Water Quality

The OWR surface water monitoring system gathers baseline data used in establishing and reviewing the state's water quality standards to measure progress and to supply information for use in development of permit limits for wastewater discharges and total maximum daily loads. The OWR performs bacteriological monitoring at selected state-owned beaches and provides intensive bacteriological monitoring of shellfishable waters. EPA protocols and USGS monitoring are included in Rhode Island's monitoring programs, as are many citizen monitoring groups, which supply supplemental water quality data for numerous rivers, lakes, ponds, and estuarine waters in the state.

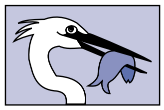
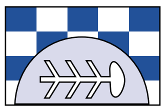
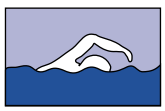
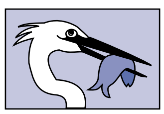
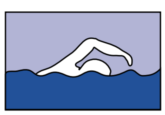
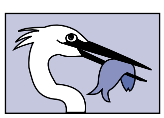
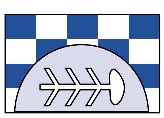
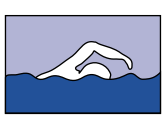
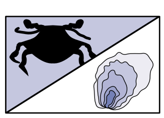
– Not reported in a quantifiable format or unknown.

[a] A subset of Rhode Island's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

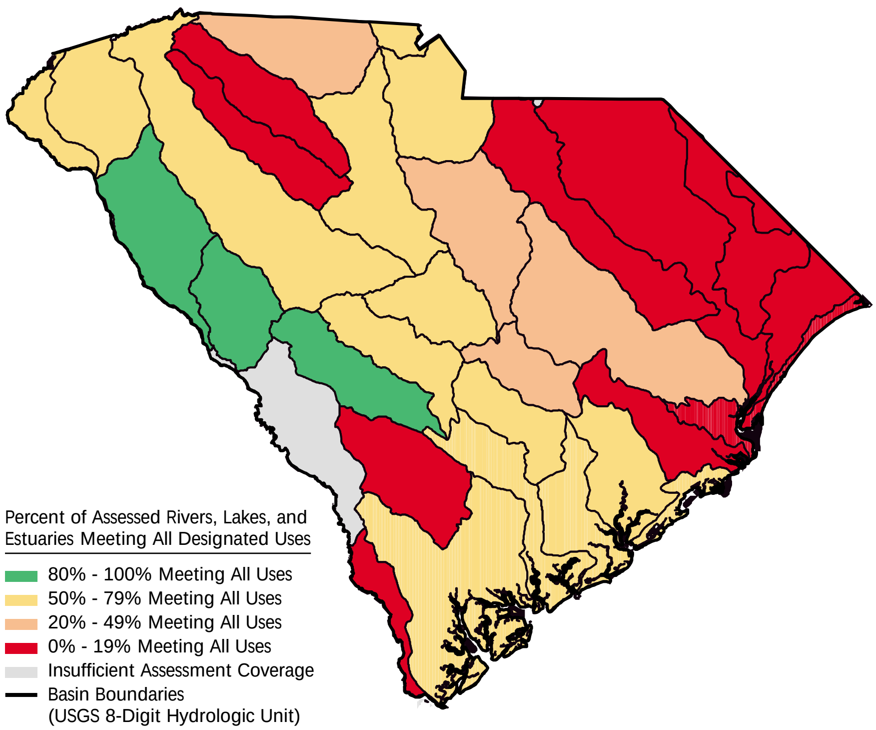
[c] Includes ocean waters.

Individual Use Support in Rhode Island

Designated Use[a]		Percent Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 1,392)[b]	Total Miles Assessed					
	721	23	50	18	9	-
	-	-	-	-	-	-
	674	52	37	4	7	-
Lakes (Total Acres = 21,300)	Total Acres Assessed					
	15,903	43	43	11	3	-
	-	-	-	-	-	-
	15,560	70	25	1	3	-
Estuaries (Total Square Miles = 152)[c]	Total Square Miles Assessed					
	152	66	18	9	7	-
	-	-	-	-	-	-
	152	77	14	7	1	-
	125	73	6	16	4	-

Note: Figures may not add to 100% due to rounding.

South Carolina



For a copy of the South Carolina 1998 305(b) report, contact:

Gina Kirkland
South Carolina Department of Health and Environmental Control
Bureau of Water Pollution Control
2600 Bull Street
Columbia, SC 29201
(803) 898-4250
e-mail: kirklagl@columb35.dhec.state.sc.us

Surface Water Quality

Eighty-seven percent of surveyed rivers, 92% of surveyed lakes, and 68% of estuaries have good water quality that fully supports aquatic life uses. Fifty-three percent of rivers, more than 99% of lakes, and 89% of estuaries fully support swimming. Unsuitable water quality is responsible for shellfish harvesting prohibitions in only 2% of the state's coastal shellfish waters. Another 11% of shellfish waters are closed as a precaution due to potential pollution from nearby marinas or point source discharges.

Bacteria are the most frequent cause of impairment (i.e., partial or nonsupport of designated uses) in rivers and streams; metals are the most frequent cause of impairment in lakes, but only 9% of lakes do not fully support all uses; and low dissolved oxygen is the most frequent cause of impairment in estuaries. Toxic contaminants do not appear to be a widespread problem in South Carolina surface waters.

South Carolina did not report on the condition of wetlands.

Ground Water Quality

Overall ground water quality remains excellent, although the number of reported ground water contamination cases rose from 60 cases in 1980 to 3,350 cases in 1998. The increase in the number of contaminated sites is primarily due to expanded monitoring at underground storage tank sites. Leaking underground storage tanks are the most common source of contamination, impacting 2,650 sites. Other major sources include spills, landfills, hazardous waste sites, and land application of waste.

Programs to Restore Water Quality

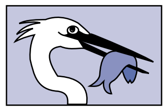
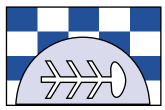
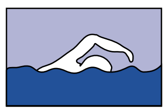
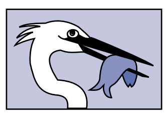
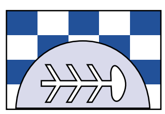
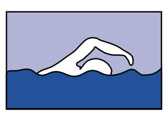
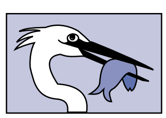
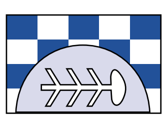
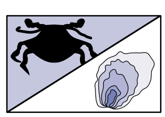
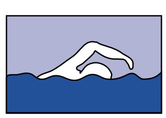
The South Carolina Department of Health and Environmental Control (DHEC) initiated a Watershed Water Quality Management

Strategy (WWQMS) to integrate monitoring, assessment, problem identification and prioritization, water quality modeling, planning, permitting, and other management activities by river drainage basins. DHEC has delineated five major drainage basins encompassing 280 minor watersheds. Every year, DHEC develops or revises a management plan and implementation strategy for one basin. The majority of water quality activities in these watersheds are based on a 5-year rotation. The basin strategies will refocus water quality protection and restoration priorities for allocation of limited resources.

Programs to Assess Water Quality

Year round, DHEC samples chemical and physical parameters monthly at fixed primary stations located in or near high-use waters. DHEC samples secondary stations (near discharges and areas with a history of water quality problems) monthly from May through October for fewer parameters. Each year, DHEC adds new watershed stations within the specific basin under investigation. Watershed stations are sampled monthly for 1 year corresponding with the WWQMS schedule.

Individual Use Support in South Carolina

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 29,898)[b]	Total Miles Assessed					
	19,524	87	-	4	9	-
	8,397	0	-	100	0	-
	19,428	53	-	21	26	-
Lakes (Total Acres = 366,576)	Total Acres Assessed					
	211,462	92	-	2	5	-
	-	-	-	-	-	-
	211,462	100	-	<1	<1	-
Estuaries (Total Square Miles = 682)	Total Square Miles Assessed					
	221	68	-	16	15	-
	-	-	-	-	-	-
	887	70	-	17	13	-
	221	89	-	5	6	-

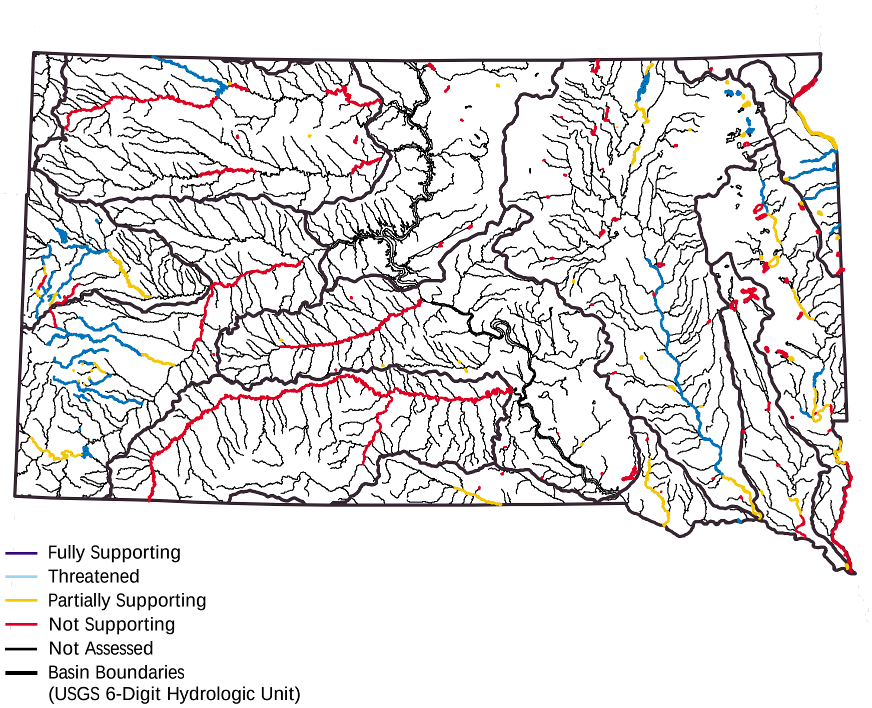
Note: Figures may not add to 100% due to rounding.

– Not reported in a quantifiable format or unknown.

[a] A subset of South Carolina's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

South Dakota



This map depicts aquatic life use support status.

For a copy of the South Dakota 1998 305(b) report, contact:

Andrew Repsys
South Dakota Department of Environment and Natural Resources
Division of Financial and Technical Assistance
Water Resources Assistance Program
523 East Capitol, Joe Foss Building
Pierre, SD 57501-3181
(605) 773-4046
e-mail: andrewr@denr.state.sd.us

Surface Water Quality

Thirty-six percent of South Dakota's assessed rivers and streams fully support aquatic life uses and 37% of the assessed rivers also support swimming. The most common pollutants impacting South Dakota streams are suspended solids due to water erosion from croplands, gully erosion from rangelands, streambank erosion, and other natural forms of erosion.

Other impacts to streams were due to elevated total dissolved solids, low dissolved oxygen, elevated pH, and water temperature. Sixteen percent of South Dakota's assessed lake acres fully support aquatic life uses and 99% of the assessed lake acres fully support swimming. The most common pollutants are nutrients and siltation from agricultural runoff and other nonpoint sources that produce dense algal blooms in many of the state's lakes.

The high water conditions that prevailed in South Dakota for most of this reporting period and last greatly increased watershed erosion and sedimentation in lakes and streams. Suspended solids criteria were severely violated in many rivers and streams, and there was an increase in the incidence of fecal coliform bacteria in swimming areas at lakes. However, water quality improved in some lakes that experienced low water levels during the late 1980s, and high flows diluted bacteria in some rivers and streams.

South Dakota did not report on the condition of wetlands.

Ground Water Quality

More than three-quarters of South Dakota's population uses ground water for domestic needs. General ground water quality is good, with only a few aquifers having naturally occurring contamination. Deeper aquifers generally have poorer water quality than shallow aquifers but are also generally less susceptible to pollution. The most significant ground water quality problems in South Dakota are human-induced ground water degradation from petroleum, nitrate, and other chemicals through accidental releases and product mishandling, poor management practices, improper locating of pollutant-producing facilities, and contamination of shallow wells due to poor construction or location adjacent to pollutant sources.

Programs to Restore Water Quality

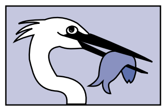
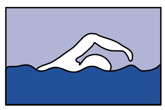
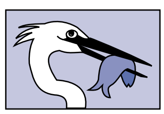
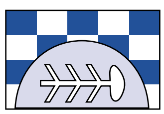
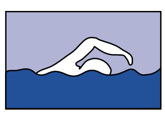
South Dakota regulates point sources through the National Pollutant Discharge Elimination System. As part of the state's point source program, South Dakota regulates concentrated animal feeding operations (CAFOs). The state offers two general permits, one for concentrated swine operations and one for other CAFOs.

South Dakota relies primarily on voluntary implementation of best management practices to control nonpoint source pollution. However, the state acknowledges that the technical and financial assistance currently available is not sufficient to solve all the NPS problems in the state. Other solutions may be explored, including enforcement to increase compliance with state and federal requirements.

Programs to Assess Water Quality

South Dakota conducts ambient water quality monitoring at established stations, special intensive surveys, intensive fish surveys, TMDL wasteload allocation surveys, and individual nonpoint source projects. Biological sampling is also conducted for special studies and diagnostic/feasibility studies. The U.S. Geological Survey, Corps of Engineers, and U.S. Forest Service also conduct routine monitoring throughout the state. Water samples are analyzed for chemical, physical, biological, and bacteriological parameters.

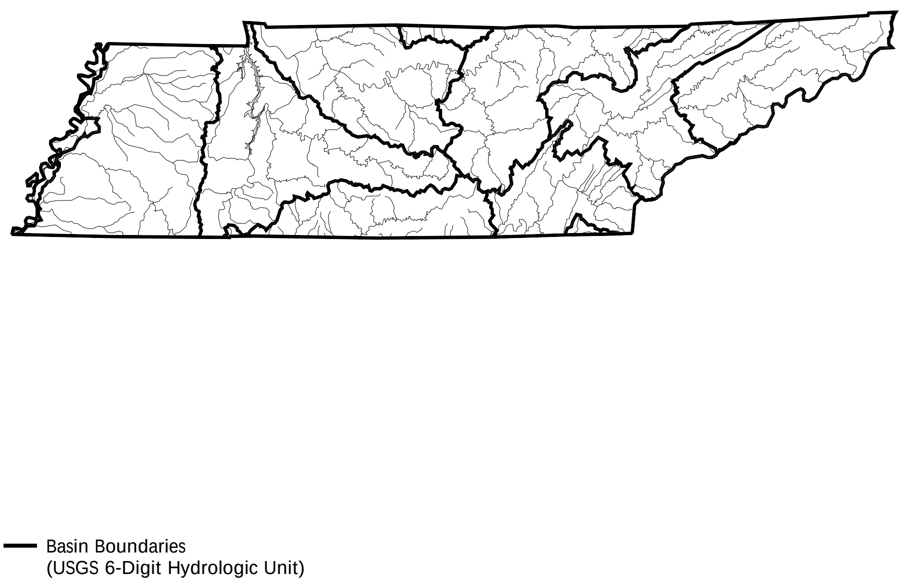
Individual Use Support in South Dakota

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 9,937)	Total Miles Assessed					
	2,986	36	-	21	44	0
	170	100	-	-	-	-
	650	37	-	10	54	0
Lakes (Total Acres = 750,000)	Total Acres Assessed					
	132,159	16	-	26	58	0
	469,297	100	-	0	0	0
	597,121	99	-	1	0	0

– Not reported in a quantifiable format or unknown.
[a] A subset of South Dakota's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

Note: Figures may not add to 100% due to rounding.

Tennessee



For a copy of the Tennessee 1998 305(b) report, contact:

Greg Denton
Tennessee Department of
Environment and Conservation
Division of Water Pollution Control
7th Floor, L&C Annex
401 Church Street
Nashville, TN 37243-1534
(615) 532-0699
e-mail: gdenton@mail.state.tn.us

Surface Water Quality

Of assessed rivers and streams, 73% fully support aquatic life uses, 21% partially support these uses, and 6% do not support them. Siltation, habitat alteration, nutrients, oxygen-depleting substances, and pathogens affect the most river miles. Toxic materials, pH, and flow alterations impact rivers to a lesser extent. Major sources of pollutants include agriculture, hydromodification, urban runoff, and municipal point sources. Intense impacts from mining occur in the Cumberland Plateau region, and poor quality water discharged from dams impacts streams in east and middle Tennessee.

Of assessed lakes, 90% fully support aquatic life uses, 3% partially support these uses, and 7% do not support them. The most widespread problems in lakes include nutrients, low dissolved oxygen, metals, flow alteration, and priority organics. Major sources of these pollutants are stream impoundments, contaminated sediments, urban runoff/storm sewers, land treatment, and spills.

Tennessee identified 54,811 acres of impacted wetlands (approximately 7% of existing wetlands). Major threats include siltation from construction and residential development and loss of function due to channelization and levees.

The Department of Environment and Conservation (DEC) maintains a monitoring program to identify public health threats. Swimming advisories were issued at 33 waterbodies due to elevated bacteria levels. Seven lakes and portions of eight rivers have fishing advisories due to fish tissue contamination. Sediment contamination due to legacy chemicals remains a problem in some lakes and streams.

Ground Water Quality

Ground water quality is generally good, but pollutants contaminate (or are thought to contaminate) the resource in localized areas. These pollutants include volatile and semi-volatile organic chemicals, bacteria, metals, petroleum products, pesticides, and radioactive materials.

Programs to Restore Water Quality

The Division of Water Pollution Control adopted a watershed approach to improving water quality and encouraging coordination with the public and other agencies. Each of the 54 watersheds is managed on a 5-year cycle coinciding with the duration of discharge permits. Tennessee is also conducting several total maximum daily load studies to allocate pollutant loading among all the point and nonpoint sources discharging into a stream or its tributaries.

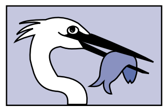
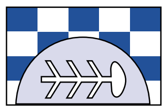
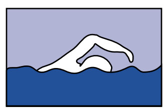
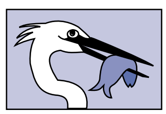
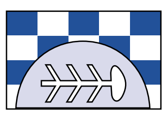
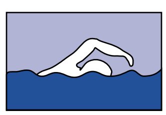
The Division is actively identifying strategies to reduce pollutant loadings at streams not currently meeting water quality standards. DEC, in partnership agreement with other agencies, has established a goal to implement 100 control strategies on TMDL-listed streams by 2003. The DEC has also developed a wetland strategy to protect and restore Tennessee's wetlands.

Programs to Assess Water Quality

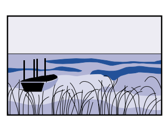
Tennessee's ambient monitoring network consists of 156 active stations sampled quarterly for conventional pollutants, nutrients, and selected metals. The state also performs intensive surveys, often including biological monitoring at streams where they suspect that human activities are degrading stream quality. The state samples toxic chemicals in fish and sediment at sites with suspected toxicity problems.

With assistance from EPA, Tennessee is subdelineating ecoregions and characterizing water quality at carefully selected reference streams to help set clean water goals on a regional, rather than statewide, basis.

Individual Use Support in Tennessee

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 61,075)[b]						
	Total Miles Assessed 53,507	73	-	21	6	-
	53,507	100	-	-	<1	-
	53,618	97	-	1	2	-
Lakes (Total Acres = 538,060)						
	Total Acres Assessed 538,585	90	-	3	7	-
	537,261	84	-	2	14	-
	537,261	97	-	1	2	-

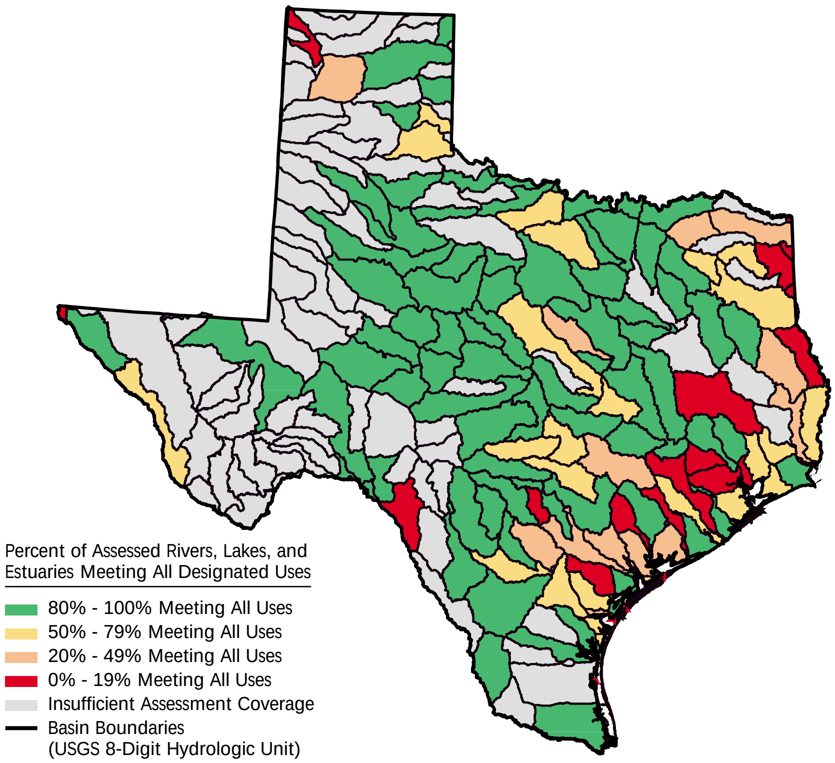
Summary of Use Support in Tennessee

		Percent: Good (Fully Supporting)	Good (Threatened)	Impaired (For One or More Uses)
Wetlands (Total Acres = 787,000)				
	Total Acres Assessed 787,000	93	-	7

– Not reported in a quantifiable format or unknown.
[a] A subset of Tennessee's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Texas



For a copy of the Texas 1998 305(b) report, contact:

Steve Twidwell
Texas Natural Resource Conservation Commission
P.O. Box 13087
Austin, TX 78711-3087
(512) 239-4607
e-mail: stwidwel@tnrcc.state.tx.us

Surface Water Quality

About 91% of the assessed stream miles fully support aquatic life uses, 3% partially support these uses, and 6% do not support aquatic life uses. Swimming is impaired in about 26% of the assessed rivers and streams. The most common pollutants degrading rivers and streams are bacteria, metals, and oxygen-depleting substances. Major sources of pollution include municipal sewage treatment plants, agricultural runoff, and urban runoff.

In reservoirs, 89% of the assessed surface acres fully support aquatic life uses, 7% partially support these uses, and 4% do not support aquatic life uses. Of the assessed lake acres, 97% fully support swimming. The most common problems in reservoirs are metals, low dissolved oxygen, and elevated bacteria concentrations. Major sources that contribute to nonsupport of uses include atmospheric deposition, natural sources (e.g., high temperature and shallow conditions), municipal sewage treatment plants, industrial point sources, and urban runoff.

The leading problem in estuaries is bacteria that contaminate shellfish beds. Sixty-one percent of the surveyed estuarine waters fully support shellfishing use, 23% partially support this use, and 16% do not support shellfishing.

Texas did not report on the condition of wetlands.

Ground Water Quality

About 41% of the municipal water is obtained from ground water sources in Texas. Identified ground water contaminant sources include storage tanks, surface impoundments, landfills, septic systems, and natural sources. The most commonly reported ground water contaminants from human activities are gasoline, diesel, and other petroleum products. Less commonly reported contaminants include volatile organic compounds and pesticides. The degradation of ground water quality from natural sources probably has a greater effect than do all anthropogenic sources combined.

Programs to Restore Water Quality

The Texas Natural Resource Conservation Commission (TNRCC) uses a basin approach to water resource management with the Clean Rivers Program (CRP). The cooperative TNRCC/CRP program is a long-term, comprehensive, and integrated approach aimed at improving coordination of natural resource functions within the agency.

Implementation of coordinated basin monitoring is one of the priorities of the program. The goal of this activity is to provide a process in which monitoring groups will coordinate their activities with the TNRCC. Coordinated monitoring meetings are held in each of the 23 basins every spring to bring together key monitoring groups (state agencies, river authorities, cities, volunteer groups, U.S. Geological Survey, Corps of Engineers, etc.). At the meetings, schedules are cooperatively developed for fixed-station and special study monitoring to reduce duplication of effort, consolidate sampling and analysis protocols, and improve spatial coverage of monitoring sites.

Programs to Assess Water Quality

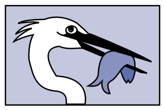
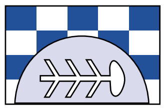
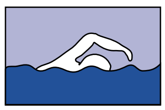
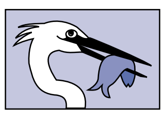
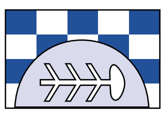
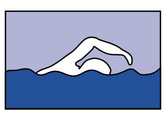
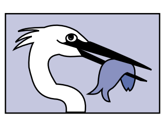
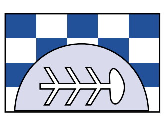
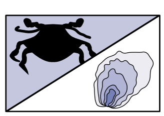
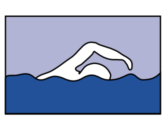
The TNRCC samples about 450 fixed stations as part of its Surface Water Quality Monitoring Program (SWQMP). The TNRCC samples different parameters and varies the frequency of sampling at each site to satisfy different needs. The TNRCC also conducts intensive surveys to evaluate potential impacts from point source dischargers during low flow conditions and special studies to investigate specific sources and pollutants. About 3,000 citizens also perform volunteer environmental monitoring in the Texas Watch Program.

– Not reported in a quantifiable format or unknown.

[a] A subset of Texas' designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

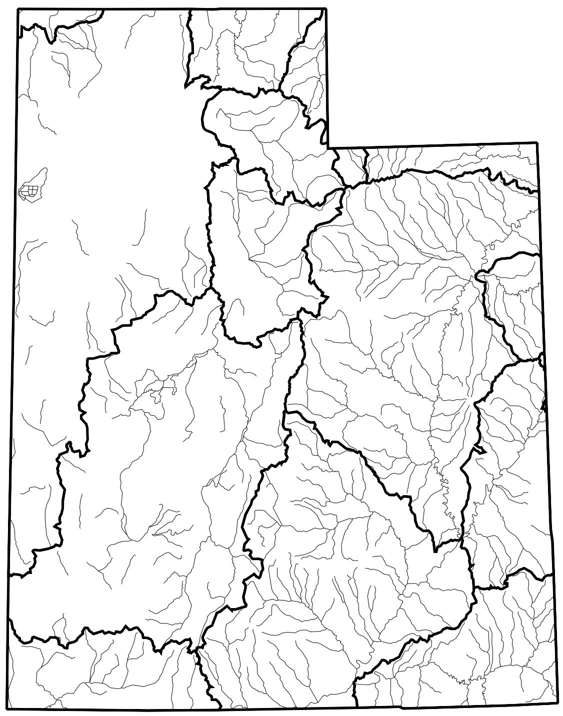
[b] Includes nonperennial streams that dry up and do not flow all year.

Individual Use Support in Texas

Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 191,228)[b]	Total Miles Assessed					
	13,634	91	0	3	6	<1
	445	33	0	14	53	0
	13,505	73	0	7	19	<1
Lakes (Total Acres = 3,065,600)	Total Acres Assessed					
	1,318,719	89	0	7	4	0
	448,155	25	0	75	<1	0
	1,240,232	97	0	0	3	0
Estuaries (Total Square Miles = 1,991)	Total Square Miles Assessed					
	1,914	92	0	7	1	0
	648	94	0	0	6	0
	1,900	61	0	23	16	0
	1,932	100	0	<1	<1	0

Note: Figures may not add to 100% due to rounding.

Utah



Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Utah 1998 305(b) report, contact:

Thomas W. Toole
Utah Department of Environmental Quality
Division of Water Quality
P.O. Box 144870
Salt Lake City, UT 84114-4870
(801) 538-6859
e-mail: eqwq.ttoole@email.state.ut.us

Surface Water Quality

Of the 8,705 river miles assessed, 82% fully support aquatic life uses, 12% partially support these uses, and 6% do not support aquatic life uses. The most common pollutants impacting rivers and streams are total dissolved solids, habitat alterations, metals, sediments, and nutrients. Agricultural practices, such as grazing, improper manure management, and irrigation, elevate nutrient and sediment loading into streams. Point sources also contribute to nutrient loads, while natural conditions and stream channel modifications also result in impairment. The loss of riparian habitat impacts the fisheries on many streams.

About 65% of the asessed lake acres fully support aquatic life uses, 34% partially support these uses, and 1% do not support aquatic life uses. The leading problems in lakes include nutrients, siltation, low dissolved oxygen, suspended solids, and noxious aquatic plants. The major sources of pollutants are agricultural practices, industrial and municipal point sources, drawdown of reservoirs, and land development.

Fish and wildlife consumption advisories are posted on the lower portion of Ashley Creek drainage and Stewart Lake in Uintah County due to elevated levels of selenium found in fish, ducks, and American coots.

Utah did not report on the condition of wetlands.

Ground Water Quality

In general, the quality of ground water in Utah has remained relatively good throughout the state, although some ground water degradation occurs in south central Utah in the metropolitan area of Salt Lake City and along the Wasatch Front area from Payson north to Brigham City. Sources that present a risk for ground water contamination include agricultural chemical facilities, animal feedlots, storage tanks, surface impoundments, waste tailings, septic systems, road salt storage areas, spills, and urban runoff. In 1994, new ground water regulations went into effect.

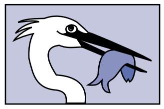
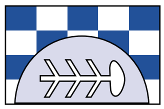
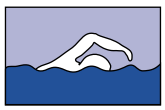
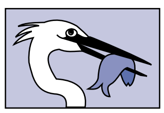
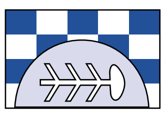
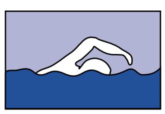
Programs to Restore Water Quality

The state's Nonpoint Source Task Force is responsible for coordinating nonpoint source programs in Utah. The Task Force is a broad-based group with representatives from federal, state, and local agencies; local governments; agricultural groups; conservation organizations; and wildlife advocates. The Task Force helped state water quality and agricultural agencies prioritize watersheds in need of NPS pollution controls. As best management practices are implemented, the Task Force will update and revise the priority list.

Programs to Assess Water Quality

In 1993, Utah adopted a basin-wide water quality monitoring approach. Intensive surveys have been completed on the lower Bear River, Weber River, Jordan River, Uinta, Sevier River, Cedar/Beaver, and Lower Colorado watershed management units. Assessments for the West Colorado and Southeast Colorado River watersheds will be completed in 1999, completing the 5-year monitoring cycle. In addition, Utah has developed a fixed-station network of 63 stations to evaluate water quality trends throughout the state. Monitoring is also conducted for Total Maximum Daily Load determinations, industrial and municipal facility compliance, nonpoint source projects, and at 18 benthic macroinvertebrate sampling stations.

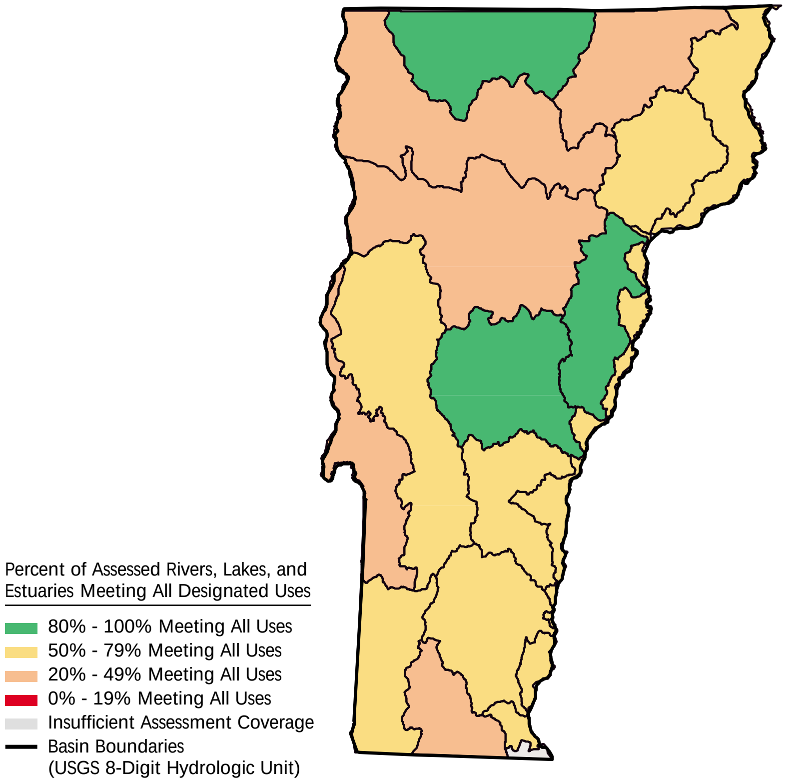
Individual Use Support in Utah

Designated Use[a]	Total Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 85,916)[b]	Total Miles Assessed					
	8,705	82	-	12	6	0
	16	0	-	0	100	0
	518	98	-	0	2	0
Lakes (Total Acres = 481,638)	Total Acres Assessed					
	460,561	65	0	34	1	0
	460,561	100	0	0	0	0
	162,760	99	0	0	1	0

– Not reported in a quantifiable format or unknown.
[a] A subset of Utah's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Vermont



For a copy of the Vermont 1998 305(b) report, contact:

Jerome J. McArdle
Vermont Agency of Natural Resources
Department of Environmental Conservation
Water Quality Division
103 South Main Street
Building 10 North
Waterbury, VT 05671-0408
(802) 241-3776
e-mail: jerrym@waterq.anr.state.vt.us

Surface Water Quality

Vermont's rotational strategy calls for assessment of one-fifth of the state each year, resulting in a complete assessment every 5 years. As part of this strategy, Vermont reported only on rivers and streams in three major river basins and on 138 lakes for the 1998 report. The current survey found that 93%, 77%, and 88% of the assessed river and stream miles in the White River, Otter Creek, and Lower Lake Champlain basins, respectively, fully support the water uses for which they have been classified. For assessed lakes, 24% fully support all designated uses, including fish consumption advisories (which primarily affect lake fish) for women of child-bearing age and children age 6 and under).

Common pollutants found in the assessed waterbodies include silt, pathogens, and nutrients, which come from eroding stream/lake banks, urban areas, and agricultural lands. Additional causes of pollution include thermal modifications, flow modifications, metals, total toxics, algae, and low dissolved oxygen resulting from atmospheric deposition, natural sources, flow regulation, and habitat alterations.

Many of Vermont's lakes and rivers have been cleaned up by construction of approximately 150 municipal and industrial wastewater treatment facilities. However, more work needs to be done to complete the cleanup job—primarily to reduce pollution from nonpoint sources.

Ground Water Quality

The quality of Vermont's ground waters is not well understood. Ground water contamination has been detected at hazardous waste sites. Other sources of concern include failing septic systems, old solid waste disposal sites, agriculture, road salt, leaking underground storage tanks, and landfills. The state needs to implement a Comprehensive Ground Water Protection Program, but lacks the financial and technical resources to do so.

Programs to Restore Water Quality

It is estimated that 90% of the miles and acres of the state's impaired waterbodies are caused by nonpoint source pollution.

Vermont has been able to effectively target areas, design work plans, compete for and capture funding and implement nonpoint source projects directed at restoring and protecting water uses and values. (Two examples of these projects are the Lake Champlain Basin Watershed Nation Monitoring Program Project, an effort to evaluate the effectiveness of improved livestock grazing, and the Vermont Better Backroads Program, a project to provide grant money to towns for BMPs).

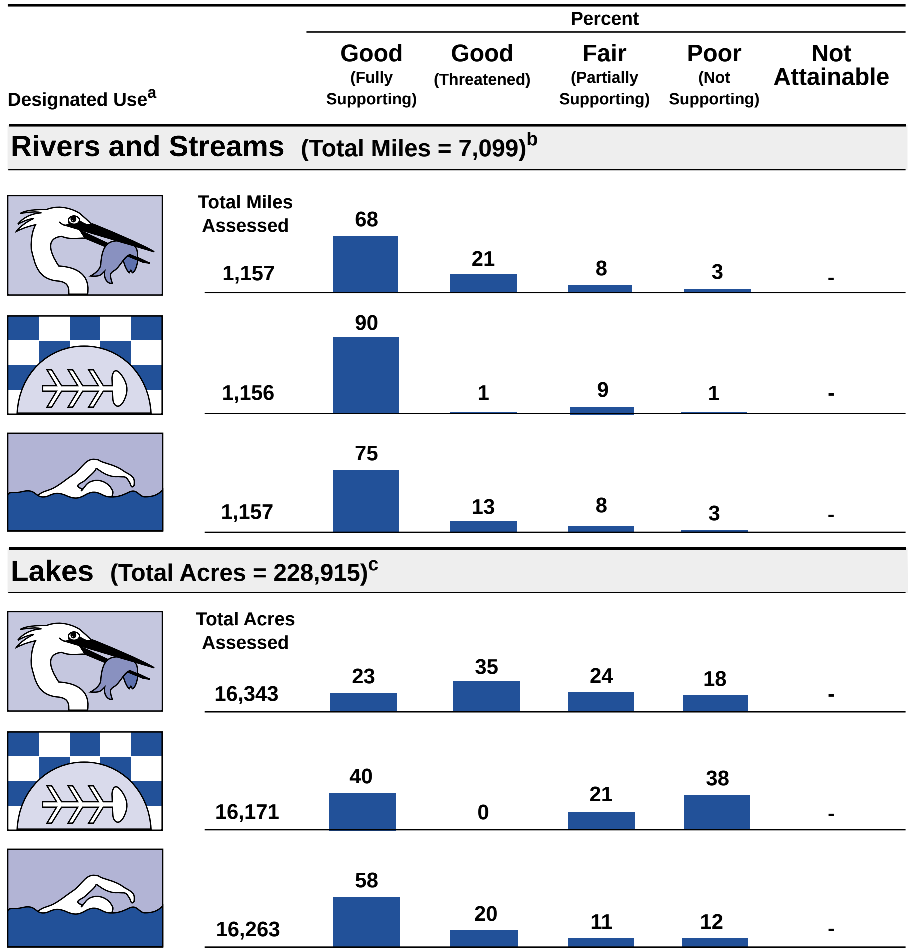
Programs to Assess Water Quality

Vermont's monitoring activities balance short-term intensive and long-term trend monitoring. Notable activities include fixed-station monitoring on lakes and ponds, citizen monitoring, long-term acid rain lake monitoring, compliance monitoring for permitted dischargers, toxic discharge monitoring, fish contamination monitoring, and ambient biomonitoring of aquatic insects and fish.

Vermont is developing a watershed approach to surface water quality planning, which calls for surface water plans for all major drainage basins or subbasins on a periodic basis. The watershed approach may also include local watershed management plans with protection and restoration strategies for individual watersheds.

Vermont is developing biological methods for vernal pools and white cedar swamps.

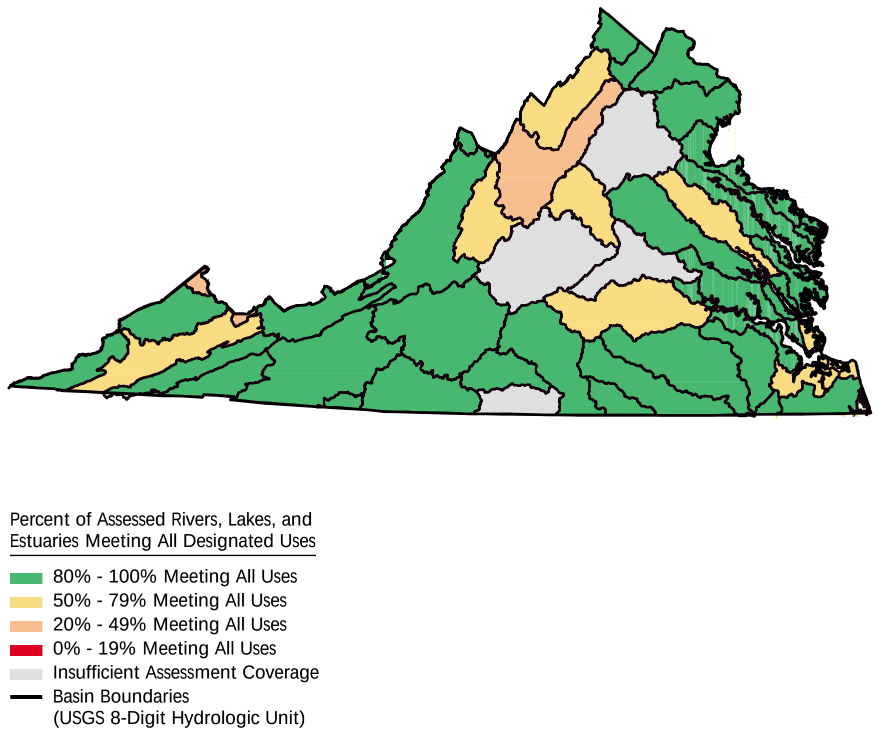
Individual Use Support in Vermont



– Not reported in a quantifiable format or unknown.
[a] A subset of Vermont's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes perennial streams only.
[c] Excluding Lake Champlain.

Note: Figures may not add to 100% due to rounding.

Virginia



For a copy of the Virginia 1998 305(b) report, contact:

Harry Augustine
Virginia Department of Environmental Quality
Water Division
Office of Water Resources Management
P.O. Box 10009
Richmond, VA 23219-0009
(804) 698-4037
e-mail: hhaugustin@deq.state.va.us

Surface Water Quality

Of the 49,358 river miles assessed, 42% fully support aquatic life use, another 51% fully support this use now but are threatened, 5% partially support this use, and 2% do not support this use. As in past years, fecal coliform bacteria are the most widespread problem in rivers and streams. Agriculture and grazing-related sources contribute much of the fecal coliform bacteria in Virginia's waters. Urban runoff also is a significant source of impacts in both rivers and estuaries.

All of Virginia's assessed publicly owned lakes fully support aquatic life use as well as fish consumption and swimming uses. Dissolved oxygen depletion, possibly associated with excess nutrients, and siltation from nonpoint sources were identified as threats to some of these lakes.

In estuaries, 7% of the assessed waters fully support aquatic life use, 81% support this use but are threatened, 10% partially support this use, and 3% do not support this use. Organic enrichment is the most common problem in Virginia's estuarine waters, followed by low dissolved oxygen concentrations. Based on available information, all of Virginia's Atlantic Ocean shoreline fully supports designated uses.

The Virginia Department of Health Bureau of Toxic Substances Information has five health advisories and one restriction currently in effect for fish consumption.

Virginia did not report on the condition of wetlands.

Ground Water Quality

Ground water programs in Virginia strive to maintain the existing high water quality. Sources of ground water contamination in the state include fertilizer and pesticide applications, underground storage tanks, landfills, septic systems, mining, and urban runoff. The Virginia Ground Water Protection Steering Committee meets bimonthly to share information, direct attention to ground water issues, and take the lead on interagency ground water protection initiatives.

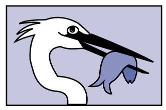
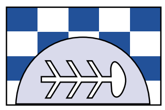
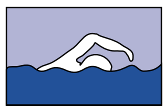
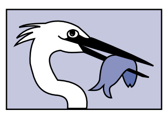
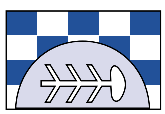
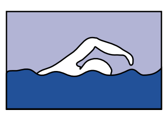
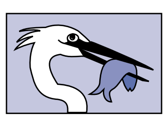
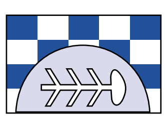
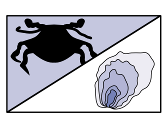
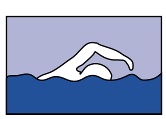
Programs to Restore Water Quality

Virginia's Department of Environmental Quality recommends control measures for water quality problems identified in the 305(b) report in their Water Quality Management Plans (WQMPs). WQMPs establish a strategy for bringing impaired waters up to water quality standards and preventing the degradation of high-quality waters. Control measures are implemented through Virginia's point source permit program and application of best management practices for nonpoint sources.

Programs to Assess Water Quality

The Ambient Water Quality Monitoring Program has grown to include 1,620 monitoring stations, of which 1,349 are ambient water quality stations and 277 are biological monitoring stations. Stations are located to gather information from industrial, urban, rural, and undeveloped areas of the state. Virginia's 305(b) assessments also utilize information from fish tissue, benthic macroinvertebrates, and volunteer monitoring programs.

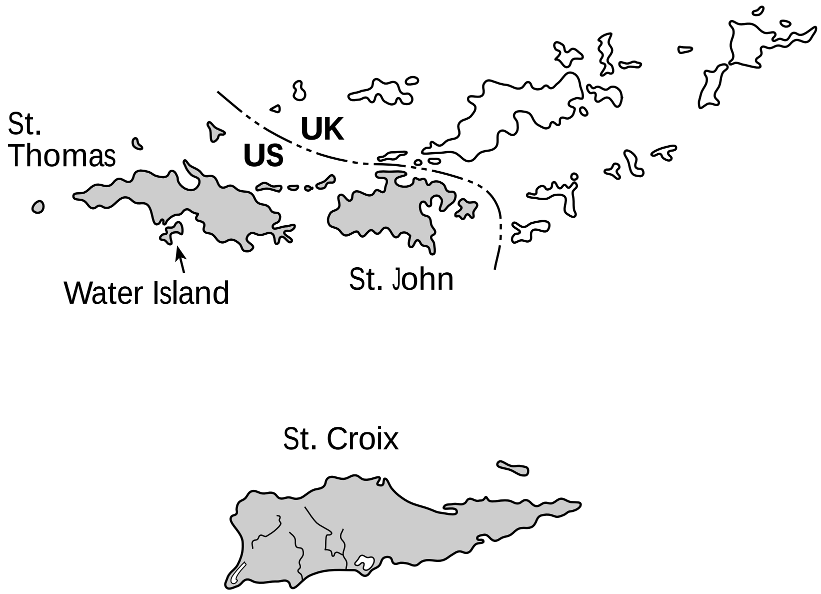
Individual Use Support in Virginia

Designated Use[a]	Total Assessed	Good (Fully Supporting) %	Good (Threatened) %	Fair (Partially Supporting) %	Poor (Not Supporting) %	Not Attainable %
Rivers and Streams (Total Miles = 49,358)[b]	Total Miles Assessed					
	20,606	42	51	5	2	-
	49,224	99	<1	<1	<1	-
	8,292	69	13	11	7	-
Lakes (Total Acres = 149,982)[c]	Total Acres Assessed					
	140,079	94	6	0	0	-
	140,062	51	49	0	0	-
	139,759	100	0	0	0	-
Estuaries (Total Square Miles = 2,451)	Total Square Miles Assessed					
	2,440	7	81	10	3	-
	2,452	90	10	-	-	-
	2,216	94	<1	5	1	-
	2,309	99	<1	1	<1	-

Note: Figures may not add to 100% due to rounding.

– Not reported in a quantifiable format or unknown.
[a] A subset of Virginia's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.
[c] Size of significant publicly owned lakes, a subset of all lakes in Virginia.

U.S. Virgin Islands



Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Virgin Island's 1998 305(b) report, contact:

Lorina L. Williams
U.S. Virgin Islands Department of Planning and Natural Resources
Division of Environmental Protection
1118 Water Gut Homes
Christiansted, St. Croix, V.I. 00820-5065
(340) 773-0565

Surface Water Quality

The U.S. Virgin Islands consist of four main islands: St. Croix, St. Thomas, St. John, and Water Island, and over 50 smaller islands and cays located in the Caribbean Sea. The islands lack perennial streams or large freshwater lakes or ponds. Water quality in the Virgin Islands is generally good but declining due to increased point source and nonpoint source discharges into the marine environment.

The Virgin Islands municipal sewage treatment plants, operated by the Virgin Islands Department of Public Works (DPW), are a major source of water quality violations in the territory. Poor preventive maintenance practices due to the lack of funding within the DPW and negligence result in numerous bypasses due to frequent breakdowns at pumpstations, as well as clogged and collapsed pipelines that frequently cause discharges into surface waters. Furthermore, stormwater runoff overwhelms the sewage treatment plant, resulting in numerous bypasses of raw or undertreated sewage into bays and lagoons.

Other water quality problems result from unpermitted discharges, permit violations by private industrial dischargers, oil spills, and unpermitted filling or dredging activities in mangrove swamps. Nonpoint sources of concern include failing septic systems, lack of erosion control measures for coastal development, lack of control measures for urban stormwater runoff, and the disposal of vessel wastes into marine waters.

Ground Water Quality

The Virgin Islands' ground water is routinely contaminated with bacteria, saltwater, and volatile organic compounds. Leaking septic tanks, municipal sewer lines, and sewage bypasses contaminate the ground water with pathogenic bacteria. The overpumping of aquifers causes saltwater intrusion of the ground water sources. The leaking of underground storage tanks, and indiscriminant dischargers of waste oil cause VOC contamination.

Programs to Restore Water Quality

The Territorial Pollutant Discharge Elimination System (TPDES) program requires that all point source dischargers obtain a permit to discharge low concentrations of pollutants into waters. The Division of Environmental Protection (DEP) performs quarterly compliance inspections.

The Virgin Islands is strengthening its Local Water Pollution Control Act and its Water Quality Standards and developing new regulations for urban stormwater runoff and for siting and constructing onsite sewage disposal systems and advocating best management practices.

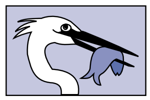
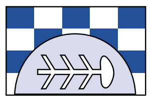
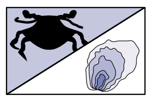
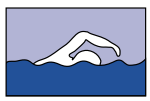
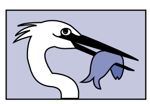
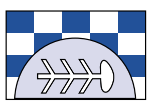
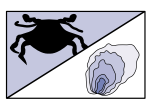
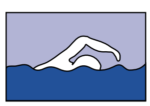
The Virgin Islands has submitted its Unified Watershed Assessment Report pursuant to the Clean Water Action Plan. More detailed assessments of the most critical watersheds requiring restoration will be developed beginning in FY 1999.

The Territory will also be developing Total Daily Maximum Loads for various waterbodies identified in the 1998 303(d) listing.

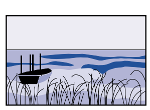
Programs to Assess Water Quality

The Ambient Monitoring Program performs quarterly sampling at 64 fixed stations around St. Croix, 57 stations around St. Thomas, 19 stations around St. John and 5 stations on Water Island. Samples are analyzed for the following parameters: fecal coliform, turbidity, dissolved oxygen, temperature, Secchi depth, and salinity. On St. Croix, 20 stations were also sampled for phosphorus, nitrogen, and suspended solids. Intensive surveys are conducted at selected sites that may be adversely affected by coastal development. The Virgin Islands does not monitor bacteria in shellfish waters or toxins in fish, water, or sediment.

Individual Use Support in the Virgin Islands

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Estuaries (Total Square Miles = 921)	Total Square Miles Assessed					
	727	73	27	<1	0	-
	51	100	0	0	0	-
	-	-	-	-	-	-
	6	100	0	0	0	-
Ocean Shoreline (Total Shore Miles = 173)	Total Shore Miles Assessed					
	4	100	0	0	0	-
	20	59	0	41	0	-
	20	59	0	41	0	-
	113	99	0	0	1	-

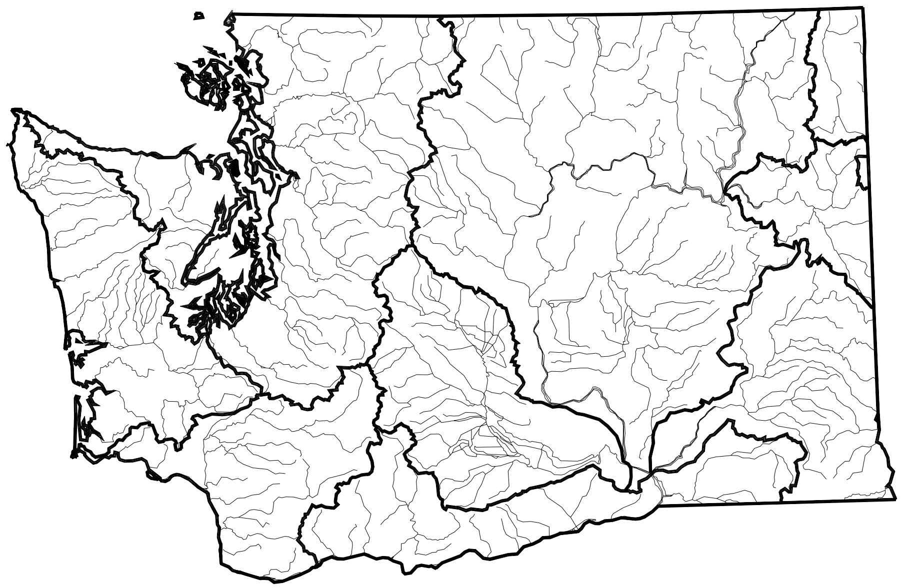
Summary of Use Support in the Virgin Islands

		Percent: Good (Fully Supporting)	Good (Threatened)	Impaired (For One or More Uses)
Wetlands (Total Acres = 3,776)	Total Acres Assessed			
	927	79	21	<1

– Not reported in a quantifiable format or unknown.

Note: Figures may not add to 100% due to rounding.

Washington



Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Washington 1998 305(b) report, contact:

Alison Beckett
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600
(360) 407-6456
e-mail: abec461@ecy.wa.gov

Surface Water Quality

Washington reports that 63% of their assessed river miles fully support aquatic life uses, 21% partially support these uses, and 16% do not support aquatic life uses. Sixty-five percent of Washington's lakes fully support state-defined "overall" use. Thirty-three percent of the surveyed estuarine waters fully support aquatic life uses, 43% partially support these uses, and 24% do not support aquatic life uses.

Low levels of dissolved oxygen, temperature and fecal coliform bacteria from nonpoint source pollution, and natural conditions are the major causes of impairment of designated uses in estuaries. Agricultural runoff, land disposal, and municipal point sources also cause impairments in estuaries. Major causes of impairment in lakes include nutrients and noxious aquatic plants. Agriculture, nonpoint source pollution, and natural conditions are the predominant sources of impairment in lakes. Other sources include urban runoff, municipal point sources, land disposal, and construction runoff. In rivers and streams, agriculture is the major source of water quality degradation, followed by hydrologic habitat modification, natural sources, and other specific and nonspecific sources. Causes of water quality impairment from these sources include thermal modification, pathogen indicators, pH, and low dissolved oxygen.

Washington did not report on the condition of wetlands.

Ground Water Quality

Washington reports ground water contamination by metals, trace elements, nitrates, pesticides, petroleum, and synthetic organic chemicals. Sources include industrial activities, agriculture, municipal wastewaters, mining, and onsite sewage systems.

Programs to Restore Water Quality

Washington provides financial incentives to encourage compliance with permit requirements, the principal vehicle for regulating point source discharges. The state also has extensive experience developing, funding, and implementing nonpoint source pollution prevention and control programs since the early 1970s. The state has developed nonpoint source control plans with best management practices for forest practices, dairy waste, irrigated agriculture, dryland agriculture, and urban stormwater. The state is now focusing attention on watershed planning. The watershed approach is designed to synchronize water quality monitoring, inspections, permitting, nonpoint activities, and funding.

Programs to Assess Water Quality

Washington implements an aggressive program to monitor the quality of lakes, estuaries, and rivers and streams. The program makes use of fixed-station monitoring to track spatial and temporal water quality changes so as to ascertain the effectiveness of various water quality programs and be able to identify desirable adjustments to the programs.

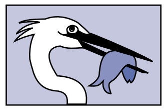
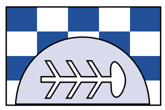
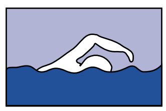
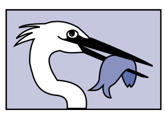
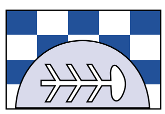
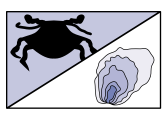
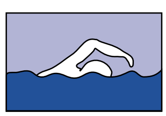
– Not reported in a quantifiable format or unknown.

[a] A subset of Washington's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

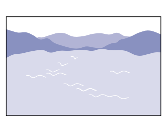
[b] Includes nonperennial streams that dry up and do not flow all year.

[c] A summary of use support data is presented because Washington did not report individual use support for lakes in their 1998 Section 305(b) report.

Individual Use Support in Washington

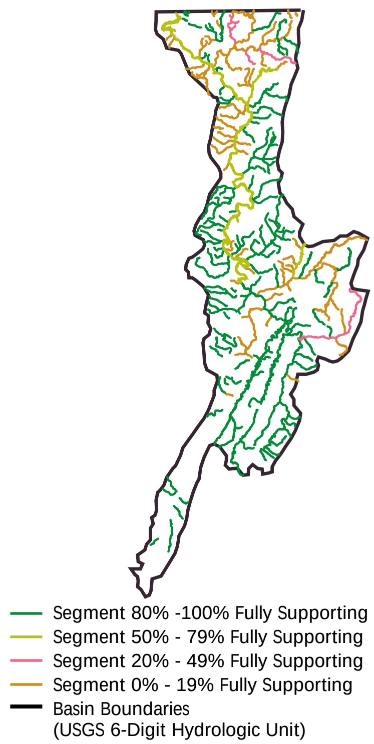
Designated Use[a]		Good (Fully Supporting) (%)	Good (Threatened) (%)	Fair (Partially Supporting) (%)	Poor (Not Supporting) (%)	Not Attainable (%)
Rivers and Streams (Total Miles = 70,439)[b]	Total Miles Assessed					
	69,317	63	-	21	16	-
	59,039	67	-	<1	33	-
	69,317	57	-	14	29	-
Estuaries (Total Square Miles = 2,904)	Total Square Miles Assessed					
	2,304	33	-	43	24	-
	-	-	-	-	-	-
	444	64	-	19	17	0
	2,904	99	-	<1	1	-

Summary of Use Support[c] in Washington

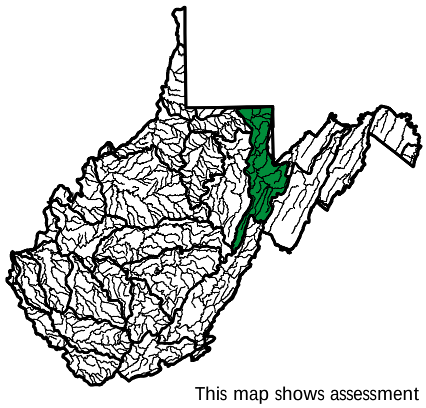
		Good (Fully Supporting) (%)	Good (Threatened) (%)	Impaired (For One or More Uses) (%)
Lakes (Total Acres = 249,277)	Total Acres Assessed			
	248,683	65	0	35

Note: Figures may not add to 100% due to rounding.

West Virginia



This map depicts aquatic life use support status.



This map shows assessment information in the Cheat river basin, one of the basins assessed for West Virginia's 1998 305(b) report under the state's rotating basin system.

For a copy of the West Virginia 1998 305(b) report, contact:

Mike Arcuri
West Virginia Division of
Environmental Protection
Office of Water Resources
1201 Greenbrier Street
Charleston, WV 25311
(304) 558-2108
e-mail: marcuri@mail.dep.state.wv.us

The report is also available on the Internet at: *http://www.dep.state.wv.us/wv/pubs.html*

Surface Water Quality

West Virginia reported that 51% of their assessed river and stream miles have good water quality that fully supports aquatic life uses, and 82% fully support swimming. In lakes, 32% of the assessed acres have good water quality that fully supports aquatic life uses and 100% fully support swimming.

Metals and siltation are the most common water quality problems in West Virginia's rivers. Nutrients, pH, oxygen-depleting substances, and pathogens also impair a large number of river miles. In lakes, siltation, turbidity, metals, and nutrients impair the greatest number of acres. Resource extraction, primarily abandoned mining, impaired the most stream miles, followed by agriculture, forestry, and municipal point sources. Petroleum activities were the leading source of degraded water quality in lakes, followed by agriculture, forestry, and construction.

West Virginia reported that fish consumption advisories are posted for the Kanawha River, Pocatalico River, Armour Creek, Ohio River, Shenandoah River, North Branch of the Potomac River, the Potomac River, and Flat Fork Creek. Five of the advisories were issued because of elevated dioxin concentrations in bottom feeders or nonsport species. The other advisories address PCBs, chlordane, and dioxin in suckers, carp, and channel catfish.

West Virginia did not report on the condition of wetlands.

Ground Water Quality

West Virginia ranked mining and mine drainage as the highest priority source of ground water contamination in the state, followed by municipal landfills, surface water impoundments (including oil and gas brine pits), abandoned hazardous waste sites, and industrial landfills. West Virginia has documented or suspects that ground water has been contaminated by pesticides, petroleum compounds, other organic chemicals, bacteria, nitrates, brine/salinity, arsenic, and other metals.

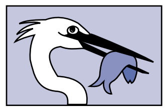
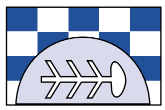
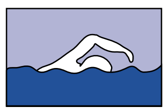
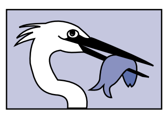
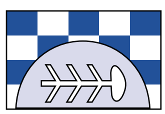
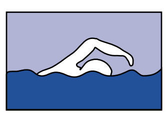
Programs to Restore Water Quality

The Office of Water Resources (OWR) is the lead agency for West Virginia's nonpoint source program. OWR works with other cooperating state agencies to assess nonpoint source impacts, then develops and implements projects designed to reduce pollutant loads from agricultural, forestry, resource extraction, urban runoff, hydromodification, and construction activities. Program initiatives are based on education, technical assistance, financial incentives, and demonstration projects. Current projects address nutrient management from livestock operations, erosion control, neutralization of acid mine drainage, pesticide usage, and road stabilization.

Programs to Assess Water Quality

West Virginia's surface water monitoring program includes compliance inspections, intensive site-specific surveys, ambient water quality monitoring, monitoring of contaminant levels in aquatic organisms, benthic and toxicity monitoring to assess perturbations, and special surveys and investigations. The state's Watershed Assessment Program (WAP) is charged with evaluating the health of West Virginia's watersheds. WAP assesses the health of a watershed by evaluating as many streams as possible, as close to their mouths as possible. The program collects and interprets water quality and biological information on watersheds on a 5-year rotating cycle. WAP began evaluating random sites in each watershed beginning in 1997.

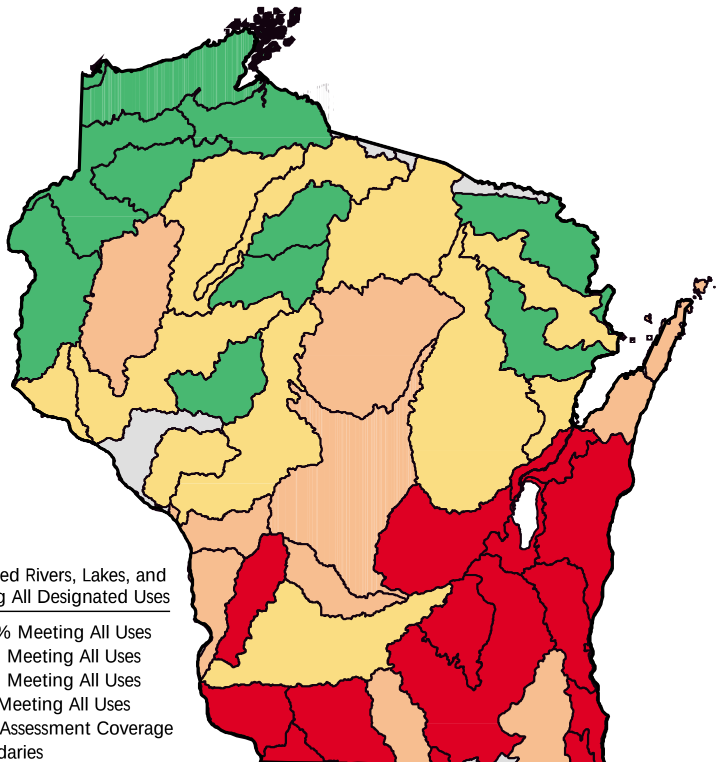
Individual Use Support in West Virginia

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 32,278)[b]	Total Miles Assessed					
	7,943	38	13	38	11	<1
	349	41	0	58	1	0
	7,841	71	11	8	10	<1
Lakes (Total Acres = 22,373)	Total Acres Assessed					
	21,523	11	21	60	8	0
	91	100	0	0	0	0
	21,523	87	13	0	0	0

[a] A subset of West Virginia's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Wisconsin



For a copy of the Wisconsin 1998 305(b) report, contact:

Ron Martin
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
(608) 266-9270
e-mail: martir@dnr.state.wi.us

Surface Water Quality

The Wisconsin Department of Natural Resources (WDNR) found that 31% of the assessed river miles fully support aquatic life uses, 25% support these uses now but are threatened, 36% partially support aquatic life uses, and 8% do not support aquatic life uses. The most prevalent problems in rivers are habitat and flow alterations, siltation, excessive nutrients, pathogens, thermal modifications, and oxygen-depleting substances. The sources of these problems are often polluted runoff, especially in agricultural areas, and river modifications, such as channelization, dam construction, and the loss of vegetation alongside streams. Municipal wastewater discharges also impair more than 1,590 miles of streams, and industrial discharges more than 1,250 miles.

About 37% of the assessed lake acres fully support aquatic life uses, 3% support these uses but are threatened, 55% partially support these uses, and 6% do not support aquatic life uses. The primary source of lake degradation is deposition of airborne pollutants, especially mercury, and polluted runoff. All of Wisconsin's Great Lakes' shoreline partially supports fish consumption use due to fish consumption advisories posted throughout the Great Lakes.

Wisconsin did not report on the condition of wetlands.

Ground Water Quality

The primary sources of ground water contamination in Wisconsin are agricultural activities, municipal landfills, leaking underground storage tanks, abandoned hazardous waste sites, and spills. Other sources include septic tanks and land application of wastewater. Nitrate-nitrogen is the most common ground water contaminant. Nitrates come from fertilizers, animal waste storage sites and feedlots, municipal and industrial wastewater and sludge disposal, refuse disposal areas, and leaking septic systems.

Programs to Restore Water Quality

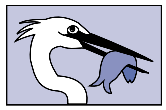
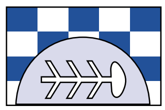
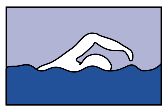
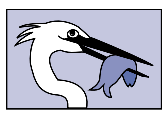
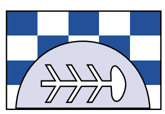
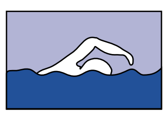
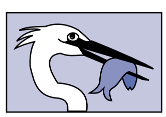
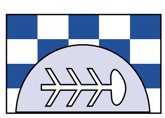
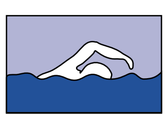
WDNR is integrating multiple agencies, programs, interests, and jurisdictions in an “ecosystem approach” that looks at all parts of the ecosystem when addressing water quality—the land that drains to the waterbody, the air above it, the plants, animals, and people using it. Since the 1970s, WDNR has prepared water quality management plans for each of the state’s river basins that summarize the condition of waters in each basin, identify improvements and needs, and make recommendations for cleanup or protection. WDNR updates the plans every 5 years and uses the plans to rank watersheds for priority projects under the Wisconsin Nonpoint Source Water Pollution Abatement Program and to address wastewater discharge concerns.

Programs to Assess Water Quality

In 1992, Wisconsin implemented a surface water monitoring strategy to support river basin planning. The strategy integrates monitoring and management activities in each of the state’s river basins on the 5-year basin planning schedule. In recent years, Wisconsin has placed more emphasis on monitoring polluted runoff and toxic substances in bottom sediments and tissues of fish and wildlife.

– Not reported in a quantifiable format or unknown.

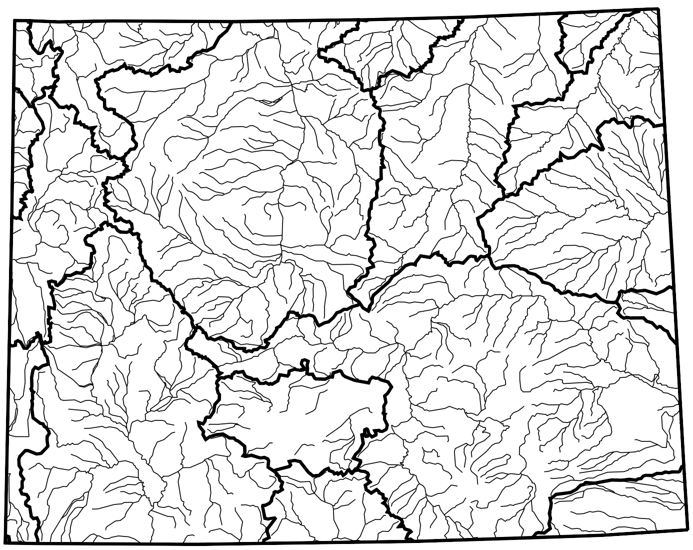
Individual Use Support in Wisconsin

Designated Use[a]	Total Assessed	Good (Fully Supporting) (%)	Good (Threatened) (%)	Fair (Partially Supporting) (%)	Poor (Not Supporting) (%)	Not Attainable (%)
Rivers and Streams (Total Miles = 57,698)[b]	Total Miles Assessed					
	22,854	31	25	36	8	<1
	3,779	75	3	18	4	<1
	-	-	-	-	-	-
Lakes (Total Acres = 982,155)	Total Acres Assessed					
	64,510	37	3	55	6	-
	105,596	59	0	0	41	-
	54,771	25	5	63	6	-
Great Lakes (Total Shore Miles = 1,017)	Total Shore Miles Assessed					
	1,017	0	79	21	0	0
	1,017	0	0	100	0	0
	-	-	-	-	-	-

[a] A subset of Wisconsin’s designated uses appear in this figure. Refer to the state’s 305(b) report for a full description of the state’s uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Note: Figures may not add to 100% due to rounding.

Wyoming



Basin Boundaries (USGS 6-Digit Hydrologic Unit)

For a copy of the Wyoming 1998 305(b) report, contact:

Mark Conrad
Wyoming Department of
Environmental Quality
Water Quality Division
Herschler Building
122 West 25th Street
Cheyenne, WY 82002
(307) 777-5802
email: mconra@missc.state.wy.us

Surface Water Quality

Historic land and water management activities, compounded by climatological events, led to accelerated loss of streamside vegetation in many parts of Wyoming during the early parts of this century. This downcutting resulted in considerable amounts of erosion, sediment loading, and sediment deposition as the streams reestablished more natural and stable channels and flood plains. Better land and water management, along with improved treatment of discharges, has improved the water quality in Wyoming over the last several decades.

Overall, the water quality in Wyoming is excellent to good in most of the state. Currently, the most widespread problems in rivers and streams are related to sediment loading, and the resultant loss of aquatic habitat, from activities such as long-duration grazing, certain irrigation practices, and some activities associated with road building and maintenance. The second most common water quality problems are localized cases of fecal contamination from urban runoff, illicit connections, and unknown sources. These problems are being addressed through numerous locally led watershed improvement projects, educational programs, and active public participation in the decision making process.

Wyoming did not report on the condition of wetlands.

Ground Water Quality

Petroleum hydrocarbons are the most common contaminants impacting Wyoming's ground water, followed by halogenated solvents, salinity/brine, nitrates, and pesticides. Common sources of contamination include leaking above- and underground storage tanks, fertilizer and pesticide application, spills, landfills, and pipelines and sewer lines. Natural contaminants are also found in Wyoming's ground water. These include radionuclides, flouride, metals, and salts whose sources are primarily subsurface geologic materials.

Programs to Restore Water Quality

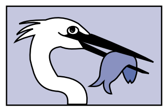
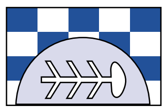
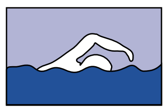
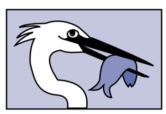
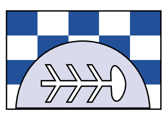
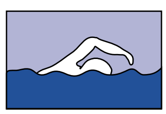
The state Department of Environmental Quality (DEQ) oversees the NPDES program in Wyoming. DEQ reviews industrial and municipal permit applications and ensures that proper design criteria are implemented. Wyoming's nonpoint source control program is nonregulatory and relies on voluntary cooperative efforts to control NPS pollution. Program efforts focus on providing information and education to the public; demonstrating, implementing, and cost-sharing best management practices; and coordinating with local, state, and federal agencies.

Programs to Assess Water Quality

In the past, Wyoming relied primarily on information from other agencies to determine which waterbodies had water quality impairments and should be listed on the 303(d) list. After a lawsuit was filed in 1996 over the state's Total Maximum Daily Loads program, it was discovered that much of the information used to list those waterbodies was inconclusive. Wyoming made an agreement with EPA that it would list on future 303(d) lists only those waterbodies that had conclusive and scientifically valid data suggesting impairment. In 1998 Wyoming tripled the size of its monitoring staff to better conduct comprehensive (biological, chemical, and physical) water quality assessments on those waterbodies on the 1996 303(d) list that lacked that conclusive and valid data. Wyoming has committed to monitoring all those waterbodies by the year 2002 and developing TMDLs on those waterbodies that need them by the year 2007.

In addition, many conservation districts have begun training to conduct credible and comprehensive water quality assessments to provide data needed for locally led water quality improvement programs.

Individual Use Support in Wyoming

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 108,767)[b]						
	Total Miles Assessed 20,188	90	2	2	<1	6
	18,997	100	0	0	0	0
	-	-	-	-	-	-
Lakes (Total Acres = 325,048)						
	Total Acres Assessed -	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

– Not reported in a quantifiable format or unknown.

[a] A subset of Wyoming's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

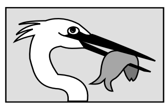
Note: Figures may not add to 100% due to rounding.

Phil Johnson, U.S. EPA, Region 8

Tribal Summaries

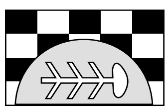
This chapter provides individual summaries of the water quality assessment data reported by eight American Indian tribes in their 1998 Section 305(b) reports. Tribal participation in the Section 305(b) process grew from two tribes in 1992 to eight tribes during the 1998 reporting cycle, but tribal water quality remains unrepresented in this report for the hundreds of other tribes throughout the country. Many of the other tribes are in the process of developing water quality programs and standards but have not yet submitted a Section 305(b) report. As tribal water quality programs become established, EPA expects tribal participation in the Section 305(b) process to increase rapidly. To encourage tribal participation, EPA has sponsored water quality monitoring and assessment training sessions at tribal locations, prepared streamlined 305(b) reporting guidelines for tribes that wish to participate in the process, and published a brochure, *Knowing Our Waters: Tribal Reporting Under Section 305(b)*. EPA hopes that subsequent reports to Congress will contain more information about water quality on tribal lands.

Section 305(b) of the CWA requires that the states biennially assess their water quality for attainment of the fishable and swimmable goals of the Act and report the results to EPA. The states, participating tribes, and other jurisdictions measure attainment of the CWA goals by determining how well their waters support their designated beneficial uses. EPA encourages states, tribes, and other jurisdictions to assess waterbodies for support of the following individual beneficial uses:



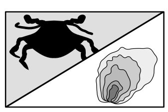
Aquatic Life Support

The waterbody provides suitable habitat for protection and propagation of desirable fish, shellfish, and other aquatic organisms.



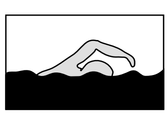
Fish Consumption

The waterbody supports fish free from contamination that could pose a human health risk to consumers.



Shellfish Harvesting

The waterbody supports a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.



Primary Contact Recreation – Swimming

People can swim in the waterbody without risk of adverse human health effects (such as catching waterborne diseases from raw sewage contamination).

Agua Caliente Band of Cahuilla Indians

Location of Reservation

For a copy of the Agua Caliente Band of Cahuilla Indians 1998 305(b) report, contact:

Michael Keller
Agua Caliente Band of Cahuilla Indians
600 East Tahquitz Canyon Way
Palm Springs, CA 92262
(760) 325-3400 x204

Surface Water Quality

The Agua Caliente Band of Cahuilla Indians is located on 31,000 acres in the upper Coachella Valley in southern California. There are approximately 73 miles of streams and rivers, including about 19 miles of perennial waters on the reservation. Beneficial uses of surface waters appear to be fully supported, although some uses may be threatened by pesticide applications, sanitation problems associated with unauthorized activity, and illegal dumping.

Ground Water Quality

Ground water quality is generally excellent in and around the reservation. Artificial recharge of the aquifer with Colorado River water has resulted in increases in total dissolved solids concentrations in some wells, primarily nearer the recharge area in the northern portion of the reservation.

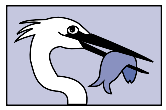
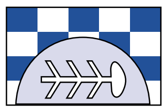
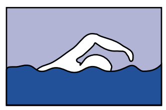
Programs to Restore Water Quality

At this time, there are no point source dischargers on the reservation, although planned industrial and wastewater treatment facilities may be permitted in the future. There is a permitted discharge upstream of the reservation. A nonpoint source control program has not been developed to date, although the tribe has applied for a Clean Water Act Section 319 grant in conjunction with the Consortium of Coachella Valley Tribal Bands and is working with other parties in the region on nonpoint source issues. Recommended future actions to address surface water concerns include designating beneficial uses and developing criteria. For ground water concerns, source substitution, conservation, monitoring, interagency coordination, and wellhead protection are recommended.

Programs to Assess Water Quality

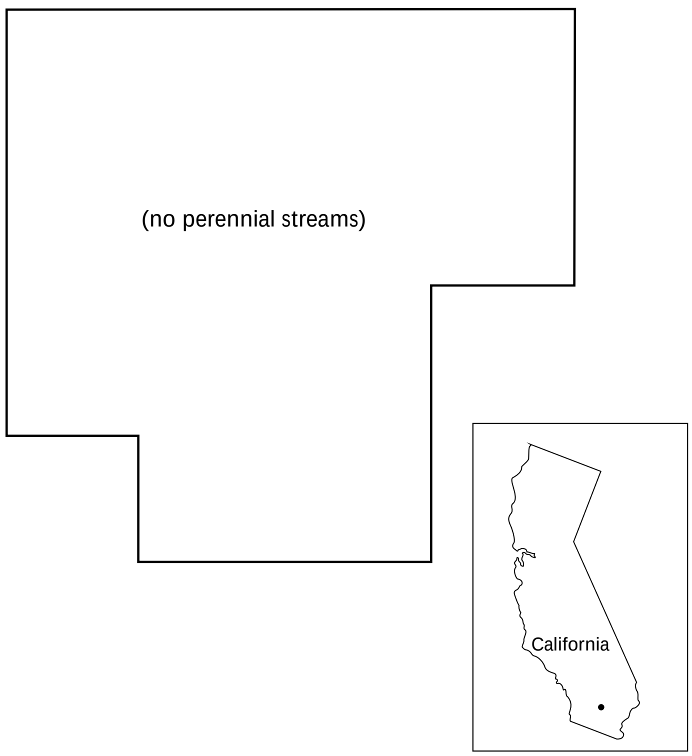
Additional routine and event surface water monitoring, as well as additional review of monitoring reports from local and state agencies, is planned for future assessments. Monitoring will include physical, chemical, micro- and macro-biological, and habitat components. Recommendations for expanded ground water monitoring have also been developed. Specific ground water concerns include monitoring total dissolved solids to identify spatial and temporal trends and patterns, compiling historical data, and installing additional piezometer wells for monitoring hydraulic gradient.

Individual Use Support in Agua Band of Cahuilla Indians

Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 67)[b]						
	67	100	0	0	0	-
		-	-	-	-	-
		-	-	-	-	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Agua Band of Cahuilla Indians' designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Augustine Band of Mission Indians



Location of Reservation

For a copy of the Augustine Band of Mission Indians' 1998 305(b) report, contact:

William Vance
Augustine Band of Mission Indians
84481 Avenue 54
Coachella, CA 92236
(760) 398-6180

Surface Water Quality

The Augustine Band of Mission Indians is located in the Coachella Valley in central Riverside County, approximately 1 mile south of the city of Coachella, on a reservation of approximately 520 acres. The sources of surface water on the reservation are the Coachella Valley Drains, which run through 2.1 miles of reservation land. Although the Coachella Valley Drains appear to be supporting the use of freshwater replenishment for the Salton Sea, this use has been threatened because of pesticides, nutrients, and microbiological indicators for other drains in the vicinity of the Augustine Reservation. Likewise, the support of warm freshwater habitat, wildlife habitat, and preservation of rare species has been assessed as supporting but threatened because of recent bird and fish die-offs and the sensitivity of the ecosystem supported by the Salton Sea. Neither swimming nor noncontact recreation are supported in the Coachella Valley Drains.

Ground Water Quality

Ground water is a significant resource for the Augustine Band, supplying water for domestic uses on the reservation. Limited data indicate that ground water contains relatively low amounts of total dissolved solids, chloride, sulfate, nitrate, and sodium. Metals such as iron, aluminum, and chromium have been detected in trace concentrations in wells on and near the reservation. Background concentrations of radionuclides (gross alpha activity) have also been detected in wells. The reservation has been impacted by illegal dumping and the overdraft of ground water by local agricultural and recreational users. Preliminary analysis of historic ground water level data in the lower valley indicates a significant decline in water levels in wells.

Programs to Restore Water Quality

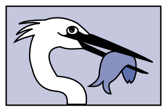
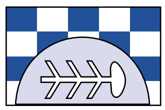
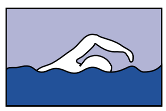
At this time, there are no point source discharges on the Augustine

Reservation. Future industrial or wastewater treatment facilities might require NPDES permits and would either be negotiated with EPA or the band. A nonpoint source program has not yet been developed for the Augustine Band, although the band will be participating in a Section 319 project performed in conjunction with the Consortium of Coachella Valley Tribes. Project tasks include monitoring, public information and education, ground water protection, construction and monitoring of wetlands test cells, fostering interagency cooperation, and implementation of best management practices.

Programs to Assess Water Quality

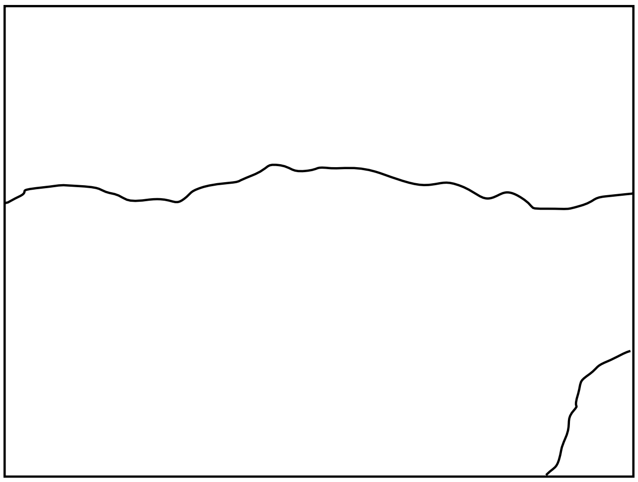
A surface water monitoring program for the Augustine Reservation has not yet been implemented. However, monitoring of the quality of stormwater runoff and irrigation drainage water is a component of the Augustine Band's overall water quality management program. Future monitoring plans include monthly ambient water quality sampling of basic parameters, metals and pesticides sampling, and grab sampling after rainfall events. The Augustine Band also recommends measuring ground water levels and analyzing ground water quality so baseline data can be developed, in conjunction with the Consortium of Coachella Valley Tribes, throughout the watershed to facilitate management of the resource.

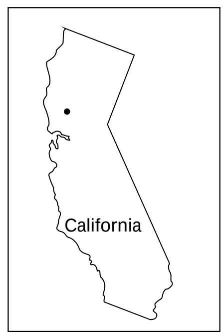
Individual Use Support in Augustine Band of Mission Indians

Designated Use[a]	Total Miles Assessed	Percent Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 2.1)[b]						
	2.1	0	100	0	0	-
	-	-	-	-	-	-
	2.1	0	0	0	100	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Augustine Band of Mission Indians' designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Cortina Indian Rancheria





Location of Reservation

For a copy of the Cortina Indian Rancheria 1998 305(b) report, contact:

Kesner Flores
Cortina Rancheria
P.O. Box 7470
Citrus Heights, CA 95621
(916) 726-7118

Surface Water Quality

The Cortina Rancheria, home to the Cortina Band of Wintun Indians, is located on 640 acres in southwestern Colusa County, California, approximately 70 miles northwest of Sacramento. Surface water resources on the Cortina Rancheria consist of a series of intermittent streams that generally flow from west to east, and one perennial stream, Strode Canyon Creek, representing a total of 6.9 miles.

Use of existing surface and ground waters on the Cortina Rancheria is limited, due to poor quality resulting from naturally occurring minerals. Most drinking and cooking water is trucked in to residents of the Rancheria from outside. Surface waters appear to support aquatic life use, although no fish have been observed. Wildlife habitat use is supported on the Rancheria, but threatened. Potential sources of water quality impairment include a small asbestos monofill, an abandoned mine, erosion from fuel breaks and fire road cuts, livestock grazing, and septic systems.

The Cortina Band did not report on the condition of wetlands.

Ground Water Quality

Ground water on the Cortina Rancheria occurs in limited quantities and is of poor quality. Eighteen wells on the Rancheria were sampled in the fall of 1995 and analyzed for a suite of conventional water quality parameters. The sampling results confirm that naturally occurring inorganic constituents are present at concentrations sufficient to impair the usefulness of the water. Ground water on the Rancheria is naturally high in total dissolved solids, iron, and chlorides. The water is also very hard and of high pH. Potential human sources of ground water contamination on the Rancheria include a septic drain field system, the asbestos monofill and settlement pond, the abandoned mine, and livestock grazing.

Programs to Restore Water Quality

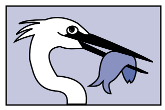
The Cortina Band of Wintun Indians is interested in the protection, management, and enhancement of the water resources of the Cortina Rancheria. The Band intends to pursue the development and implementation of a variety of water quality management programs, including those authorized under the federal

Clean Water Act, as it determines to be appropriate to properly manage its water resources. The Cortina Band is in the process of applying for Clean Water Act Section 106 program authorization and funding, and will develop water quality standards for the Rancheria under this program. While the Band does not currently have a nonpoint source control program, one is likely to be developed in the near future and will address the development and implementation of best management practices. At this time there are no point source discharges on the Cortina Rancheria.

Programs to Assess Water Quality

The Cortina Rancheria water quality assessment report is based on existing information. Some surface and ground water quality data have been collected on the Rancheria, primarily in conjunction with the Bureau of Indian Affairs special studies and tribal Integrated Solid Waste Management facility development activities. The Cortina Band intends to continue the development and implementation of its water quality monitoring and assessment activities under the Section 106 program. The monitoring program adopted for the Rancheria will be used to determine: (1) water quality status, use support, and trends; (2) sources of water quality problems and their priority; (3) water quality management program design and implementation measures; and (4) water quality program evaluation (i.e., compliance, effectiveness, needs assessment, and reporting). In addition, the Band plans to develop data management systems, including geographic information system capabilities, to enhance tribal water resource management capabilities.

Individual Use Support in Cortina Indian Rancheria

Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 6.7)[b]						
	2	-	100	-	-	-
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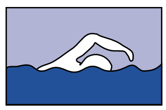
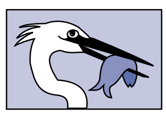
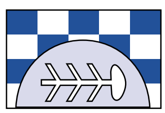
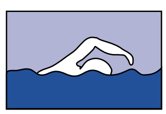
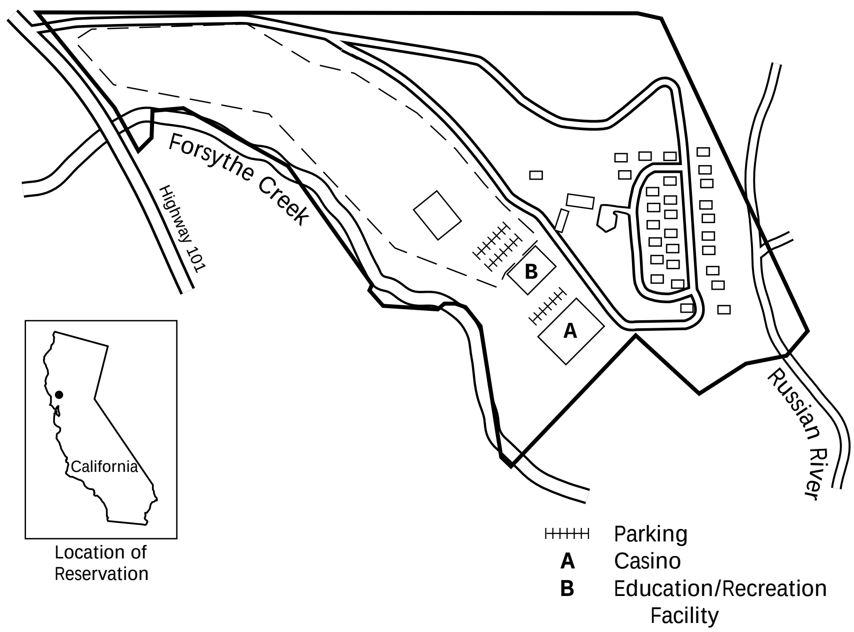
	-	-	-	-	-	-
Lakes (Total Acres = 0.1)						
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

– Not reported in a quantifiable format or unknown.
[a] A subset of Cortina Indian Rancheria's designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Coyote Valley Reservation



For a copy of the Coyote Valley Reservation 1998 305(b) report, contact:

Jean Hunt or **Sharon Ibarra**
The Coyote Valley Reservation
P.O. Box 39
Redwood Valley, CA 95470
(704) 485-8723

Surface Water Quality

The Coyote Valley Band of the Pomo Indians is a federally recognized Indian tribe, living on a 57-acre parcel of land in Mendocino County, California. Segments of the Russian River and Forsythe Creek flow past the Reservation, although flow diminishes in the summer and fall. Fishing, recreation, and religion are important uses for surface waters within the Reservation.

Currently, the tribe is concerned about bacteria contamination in the Russian River, potential contamination of Forsythe Creek from a malfunctioning septic system leachfield, and habitat modifications in both streams that impact aquatic life. Past gravel mining operations removed gravel spawning beds, altered flow, and created very steep banks. In the past, upstream mining also elevated turbidity in Forsythe Creek. The tribe is also concerned about a potential trend of increasing pH values and high water temperatures in Forsythe Creek during the summer.

Ground Water Quality

The Coyote Valley Reservation contains three known wells, but only two wells are operable and only one well is in use. The old shallow irrigation well (Well A) was abandoned because it went dry after the gravel mining operation on Forsythe Creek lowered the water table. Well B, located adjacent to Forsythe Creek, is used as a water supply for an education/recreation facility on the Reservation. Well C, located on a ridge next to the Reservation's housing units, is not in use due to severe iron and taste problems. Sampling also detected high levels of barium, total dissolved solids, manganese, and conductivity in Wells B and C. However, samples from Well B did not contain organic chemicals, pesticides, or nitrate in detectable amounts. Human waste contamination from septic systems may pose the greatest threat to ground water quality.

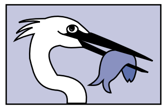
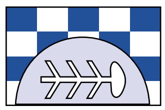
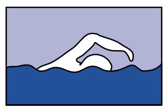
Programs to Restore Water Quality

Codes and ordinances for the Reservation will be established to create a Water Quality and Management Program for the Reservation. With codes in place, the Coyote Valley Tribal Council will gain the authority to restrain the discharge of pollutants that could endanger the Reservation water supply and affect the health and welfare of its people, as well as people in the adjacent communities.

Programs to Assess Water Quality

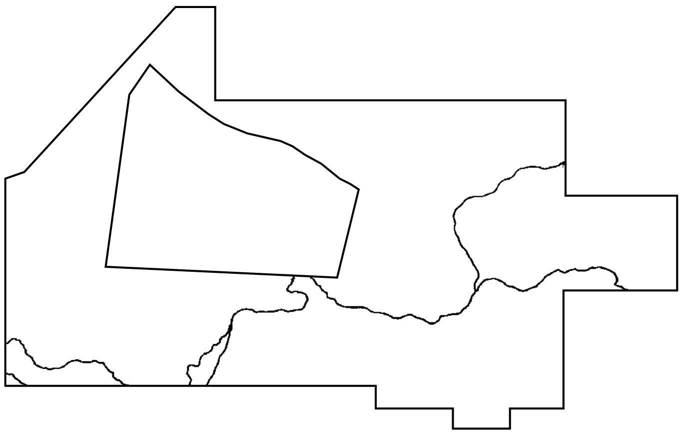
The Tribal Water Quality Manager will design a monitoring system with assistance from environmental consultants. The Water Quality Manager will sample a temporary monitoring station on Forsythe Creek and a proposed sampling station on the Russian River every month. A fisheries biologist will survey habitat on the rivers every other year, as funding permits. These activities will be funded through an EPA General Assistance Program (GAP) grant. GAP grants assist tribes in increasing their capacity to administer environmental programs.

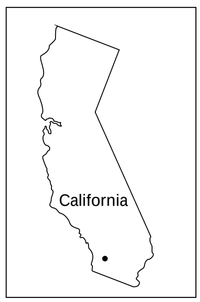
Individual Use Support in Coyote Valley Reservation

		Percent				
Designated Use[a]	Total Miles Assessed	Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Poor (Not Attainable)
Rivers and Streams (Total Miles = 0.56)[b]						
	0.52	0	23	77	0	0
	0.52	0	23	77	0	0
	0.52	0	77	0	23	0

[a] A subset of Coyote Valley Reservation's designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

La Jolla Band of Indians





Location of Reservation

For a copy of the La Jolla Band of Indians 1998 305(b) report, contact:

Jack Musick
La Jolla Band of Indians
22000 Highway 76
Pauma Valley, CA 92061
(760) 742-3771

Surface Water Quality

The La Jolla Band of Indians is located on 8,900 acres in southern California characterized by rugged topography and a relatively wet climate. There are approximately 37 miles of streams and rivers, including about 4 miles of perennial waters. The San Luis Rey River, the principal waterbody on the reservation, was assessed as having threatened use support. The suspected causes of degradation include metals (selenium), ammonia, and total dissolved solids, flow alterations, and pathogen indicators. Suspected sources of degradation include agriculture and hydrologic and habitat modifications.

The La Jolla Band did not report on the condition of wetlands.

Ground Water Quality

Ground water, as both springs and wells, is used for drinking water supply. Data from samples in the Upper San Luis Rey basin indicate exceedances of standards for iron, manganese, sulfate, chloride, total dissolved solids, and pH. Potential sources of contamination include wastewater from individual and community septic systems, solid waste disposal sites, agriculture, underground storage tanks, and inactive wells.

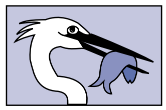
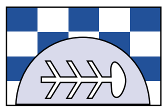
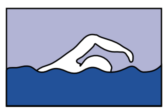
Programs to Restore Water Quality

The tribe's water pollution control program is implemented through a number of activities, including designating beneficial uses, adopting criteria and standards, permitting, compliance and enforcement, and education. The tribe is also participating in a Clean Water Act Section 319 nonpoint source control project, which includes planning, voluntary and regulatory-based implementation of best management practices, permit issuance, and education. A Wellhead Protection Program is also recommended to protect water quality and public health.

Programs to Assess Water Quality

Water quality data collected in the San Luis Rey River Water Quality Management Plan were used for the assessment. A sampling and analysis plan has been completed for a one-time sampling event to fill in gaps in water quality data for both surface and ground waters and better evaluate causes and sources of degradation.

Individual Use Support in La Jolla Band of Indians

Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 36)[b]						
	-	-	-	-	-	-
	-	-	-	-	-	-
	8	0	100	0	0	-

– Not reported in a quantifiable format or unknown.
[a] A subset of La Jolla Band of Indians' designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Manzanita Band of Mission Indians

Location of Reservation

For a copy of the Manzanita Band of Mission Indians' 1998 305(b) report, contact:

Leroy J. Elliott
Manzanita Band of Mission Indians
P.O. Box 1302
Boulevard, CA 91905
(619) 766-4930

Surface Water Quality

The Manzanita Band of Mission Indians is located on a reservation of 3,579 acres in southeastern San Diego County, California, within 10 miles of the Mexican border. Surface water resources of the Manzanita Reservation include approximately 2.1 miles of perennial streams including portions of Tule Creek, 9.1 miles of intermittent streams, 1.8 acres of pond, and 21.3 acres of wetlands. Initial monitoring results indicate that Tule Creek does not appear to be supporting water contact recreation at this time based on fecal coliform densities. The causes of water quality impairment are pathogen indicators, with cattle and horses identified as potential sources.

The Manzanita Band did not report on the condition of wetlands.

Ground Water Quality

Ground water resources on the Manzanita Reservation include wells and springs. Of the 26 wells analyzed for nitrate, 4 exceeded EPA's maximum contaminant level and another 13 yielded nitrate concentrations greater than half the MCL. Other sampling indicated pathogen contamination. Suspected sources of ground water contamination include cattle, horses, septic systems, and natural sources. Another concern is the protection of wellhead integrity.

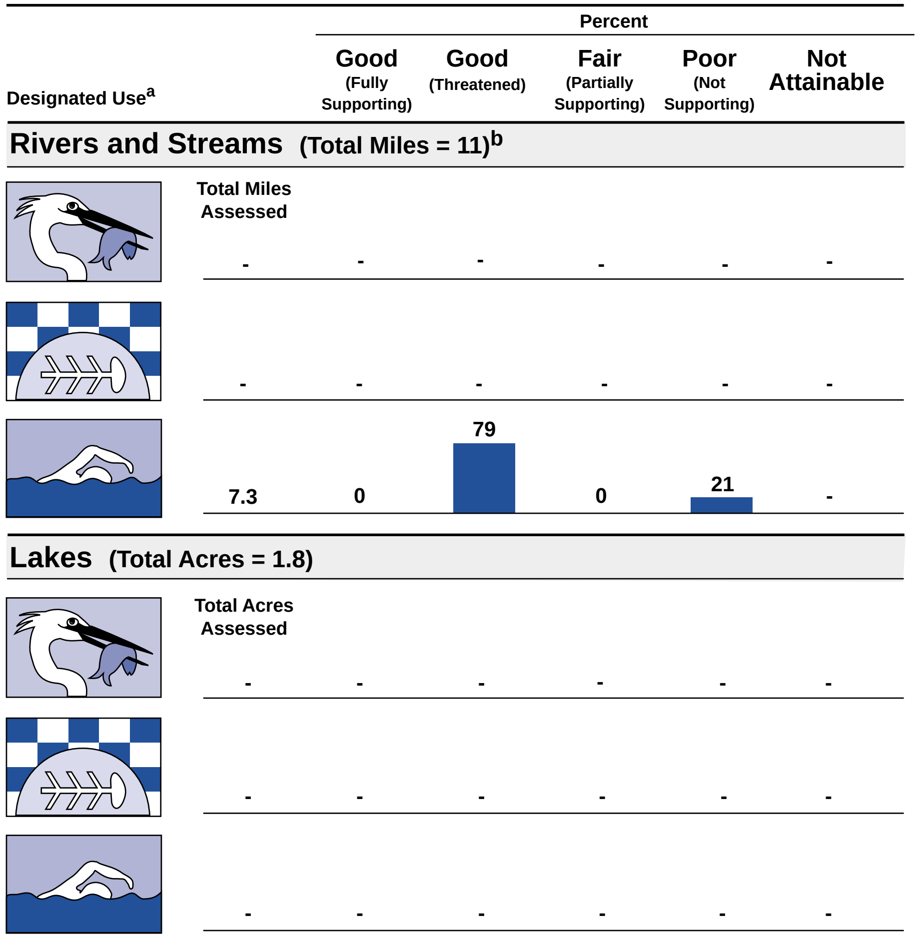
Programs to Restore Water Quality

At this time, there are no point source discharges on the Manzanita Reservation. Future industrial or wastewater treatment facilities might require National Pollutant Discharge Elimination System permits and would either be negotiated with EPA or the band. A nonpoint source program has not yet been developed for the Manzanita Band, although the band recommends implementation of a wellhead protection and rehabilitation program, wetland restoration plan, nonpoint source management plan, and stream bank restoration plan to address the reservation's water quality concerns. A GIS database developed for the Manzanita Reservation can be used for spatial analysis of nonpoint pollution sources, causes, and management options.

Programs to Assess Water Quality

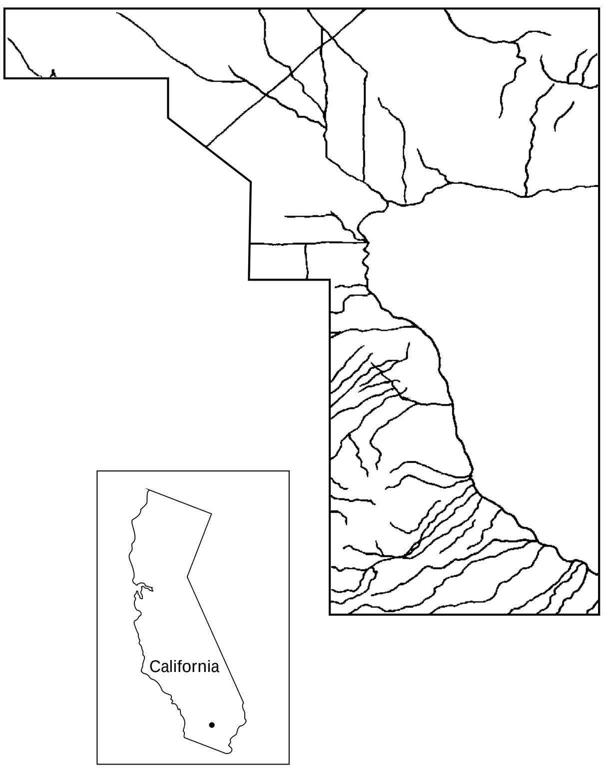
A surface water monitoring program for the Manzanita Reservation has not yet been implemented. Based on recommendations in the band's 305(b) report and in accordance with the band's Section 106 water quality management program, a monitoring program will be implemented for the routine field testing of basic water quality parameters. The Manzanita Band has also proposed a ground water monitoring program that would include such constituents as minerals, metals, volatile organics, pesticides, PCBs, radionuclides, and pathogens.

Individual Use Support in Manzanita Band of Mission Indians



– Not reported in a quantifiable format or unknown.
[a] A subset of Manzanita Band of Mission Indians' designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Torres-Martinez Desert Cahuilla Indians



Location of Reservation

For a copy of the Torres-Martinez Desert Cahuilla Indians 1998 305(b) report, contact:

Patricia A. Galaz
Torres-Martinez Desert Cahuilla Indians
66-725 Martinez Road
P.O. Box 1160
Thermal, CA 92274
(760) 397-8144

Surface Water Quality

The Torres-Martinez Desert Cahuilla Indians Reservation is located in the Coachella Valley in southern California on 24,800 acres, with 9,600 acres located in the Salton Sea. There are 77.1 miles of intermittent streams and rivers, with no perennial waters on the reservation. Over 95% of river and stream miles are considered to be threatened or not supporting aquatic users because of concerns with elevated total dissolved solids, nutrient, pesticide, and bacterial concentrations. The Salton Sea is assessed as not supporting fish consumption and water contact recreation uses because of recent bird and fish mortality events related to outbreaks of avian botulism. Its uses for secondary recreation, warm freshwater and wildlife habitat, and preservation of rare species are assessed as partially supporting because of these mortality events.

The assessment of wetlands on the Torres-Martinez Reservation was included in the lakes assessment.

Ground Water Quality

Ground water is a significant resource for the Torres-Martinez Band. Limited data from 13 wells sampled from 1974 to 1993 were used for the 1998 assessment. This assessment identified water quality concerns associated with high total dissolved solids concentrations near the Salton Sea and the presence of arsenic. An overdraft of ground water resulting in significant declines in ground water levels is also of concern.

Programs to Restore Water Quality

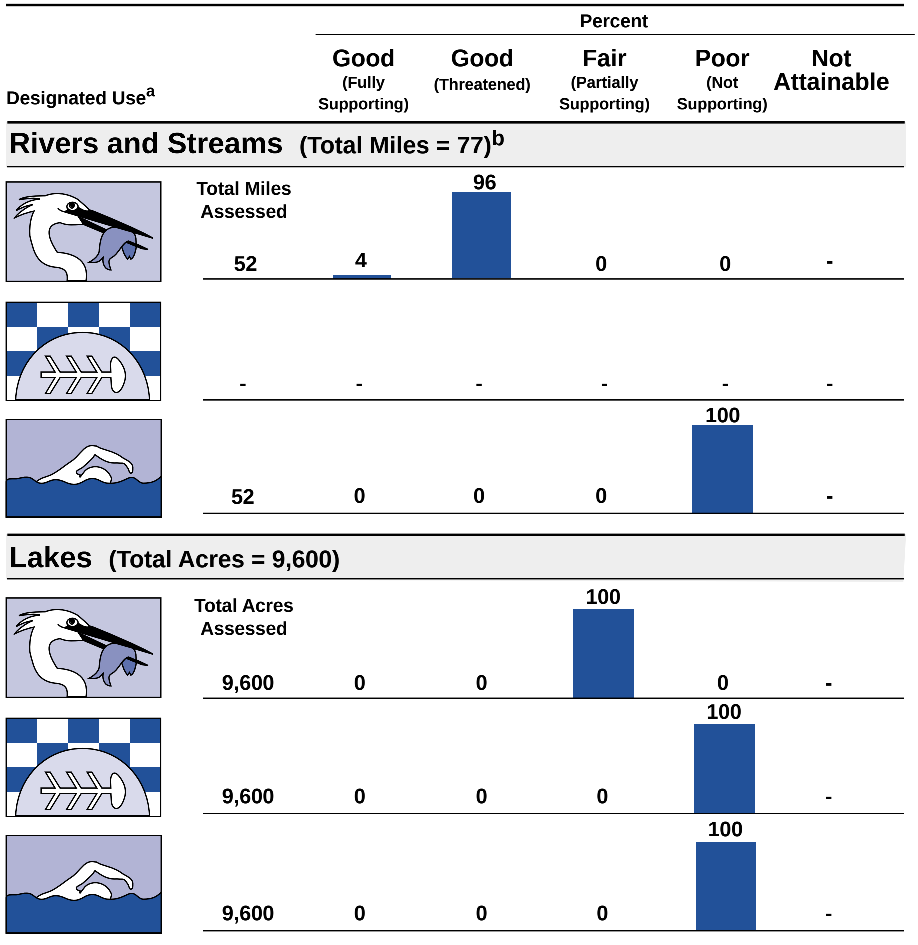
At this time, there are no point source dischargers on the reservation, although planned industrial and wastewater treatment facilities may be permitted in the future. A nonpoint source control program has not been developed to date, although the tribe is planning to participate in a Clean Water Act Section 319 grant in conjunction with the Consortium of Coachella

Valley Tribal Bands and is working with other parties in the region on nonpoint source issues. Recommended future actions to address surface water concerns include an integrated program of monitoring, education, ground water protection, construction and monitoring of wetland test cells, interagency cooperation, and implementation of nonpoint source management practices.

Programs to Assess Water Quality

The conditions associated with outbreaks of avian botulism appear to be related to pH, salinity, temperature, and redox potential. A monitoring plan has been developed for these constituents for major drains and channels and the Salton Sea, in collaboration with the National Wildlife Health Center. Monitoring is also planned to evaluate the ability of constructed wetlands to treat agricultural drainage water before discharge to the Salton Sea. Additional monitoring is planned for future assessments. Monitoring will include physical, chemical, micro- and macro-biological, and habitat components. Recommendations for expanded ground water monitoring for arsenic, total dissolved solids, and a number of other chemical and biological parameters have also been developed.

Individual Use Support in Torres-Martinez Desert Cahuilla Indians

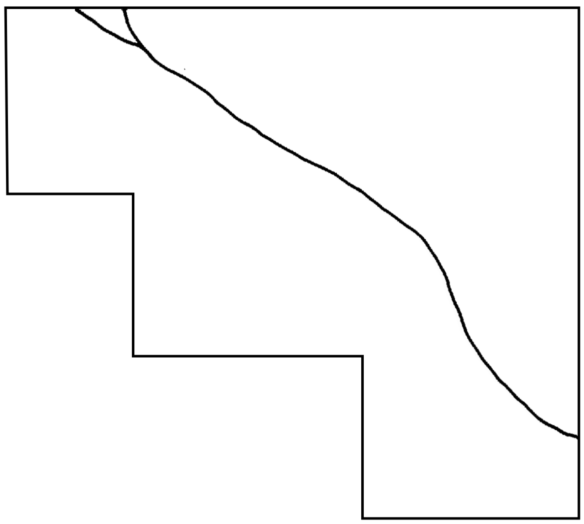


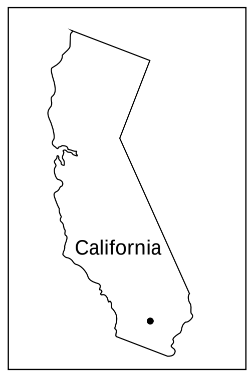
– Not reported in a quantifiable format or unknown.

[a] A subset of Torres-Martinez Desert Cahuilla Indians' designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Twenty-Nine Palms Band of Mission Indians





Location of Reservation

For a copy of the Twenty-Nine Palms Band of Mission Indians 1998 305(b) report, contact:

Marshall Cheung
Twenty-Nine Palms Band of Mission Indians
46-200 Harrsion Street
Coachella, CA 92236
(760) 775-4227

Surface Water Quality

The Twenty-Nine Palms Band of Mission Indians Reservation is located on two parcels of land totaling 390 acres in southern California upstream of the Salton Sea. Surface waters include the Coachella Valley Stormwater Channel and intermittent washes. For the 1998 cycle, aquatic life uses in all assessed streams were threatened, and swimming uses were assessed as not supporting. Unknown toxicity, chlorine, and bacteriological contamination are identified causes of impairment. Municipal point sources, agriculture, urban runoff, hydromodification, habitat modification, and filling and draining are identified sources of pollution. Special tribal concerns include improving monitoring programs, extensive pesticide and fertilizer application in the watershed, and recent massive bird and fish kills in the Salton Sea.

The wetlands associated with the Coachella Valley Stormwater Channel were included in the rivers and streams assessment.

Ground Water Quality

Ground water is a significant resource for the Twenty-Nine Palms Reservation and is threatened by local agricultural and recreational users. Fluoride, total dissolved solids, sulfate, and uranium have been detected in ground water. A trend of increasing total dissolved solids in combination with declining ground water levels is also of concern. Improved monitoring, water conservation, and land-use planning are recommended to reduce demand for water and contamination.

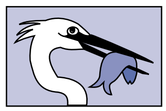
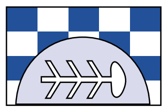
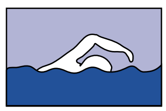
Programs to Restore Water Quality

Over the next several years, new use classification, criteria and standards, permitting, compliance and enforcement, and education initiatives will be pursued as part of the point source control program. The band will be participating in a Clean Water Act Section 319 nonpoint source control project as well, in conjunction with the Consortium of Coachella Valley Tribes.

Programs to Assess Water Quality

The 1998 305(b) report was prepared for the initial year of the CWA Section 106 water pollution control program. The major planned assessment activity is a CWA Section 319 project, which will focus on conditions in drainage waters and the Salton Sea as part of an effort to investigate conditions associated with outbreaks of avian botulism. This project will provide a vehicle for developing partnerships among local tribes, a number of agencies, business interests, and the general public.

Individual Use Support in Twenty-Nine Palms Band of Mission Indians

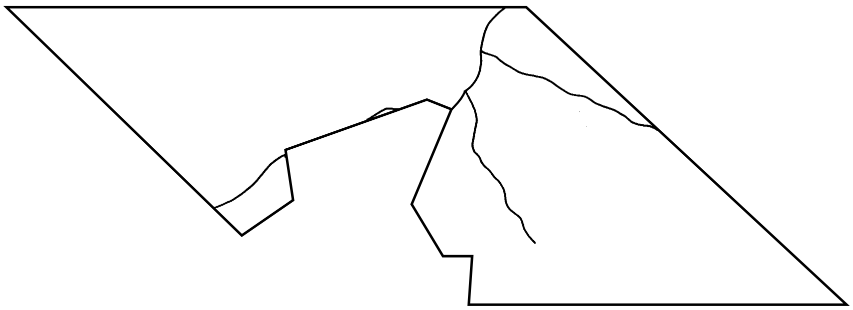
Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 3)[b]						
	1	0	100	0	0	-
	-	-	-	-	-	-
	1	0	0	0	100	-

– Not reported in a quantifiable format or unknown.

[a] A subset of Twenty-Nine Palms Band of Mission Indians' designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Yavapai-Prescott Reservation



Location of Reservation

For a copy of the Yavapai-Prescott Reservation 1998 305(b) report, contact:

Heidi Pruess
Yavapai-Prescott Reservation
530 E. Merritt Avenue
Prescott, AZ 86301
(520) 445-8790

Surface Water Quality

The Yavapai-Prescott Reservation is located on 1,395 acres in north-central Arizona, adjacent to the city of Prescott. The tribe reported that surveyed surface waters are generally meeting requirements for livestock and wildlife but are not supporting swimming and drinking uses. Arsenic, other metals, nutrients, radon, and pathogens are the primary causes of nonsupport in rivers and streams. Natural sources, industrial point sources, grazing, leaking underground storage tanks, and runoff are the principal sources of pollution. Nonpoint source contamination from ranching and from populated areas in and around Prescott are major concerns of the tribe, as is the bioremediation of a Superfund site on the reservation.

The Yavapai-Prescott Reservation did not report on the condition of wetlands.

Ground Water Quality

In general, aquifers on reservation land are shallow and recharge rates are relatively high. There are no active water supply wells located on the reservation; the tribe receives its domestic water supply from the city of Prescott. Radon has been found to occur naturally in levels above the maximum contaminant level in each well sampled on the reservation, thereby prohibiting use for drinking water without treatment. Petroleum products have been found in one well.

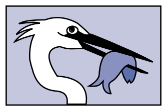
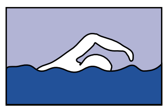
Programs to Restore Water Quality

Since 1992, the tribe has taken several steps to protect and restore surface water. A Water Management Plan was developed that included land-use planning components to protect water and help the economy of the tribe. More recently, the tribe was awarded a grant to restore 12 acres of wetlands impacted by sand and gravel mining and cattle grazing via fencing and replanting. Underground storage tanks on and near the reservation have been inventoried and risks of contamination mapped. Over 90% of the septic tanks on the reservation have been removed, with sewage needs being met through the city of Prescott system.

Programs to Assess Water Quality

In 1995 the Yavapai-Prescott tribe received a grant under Section 106 of the Clean Water Act to evaluate surface and ground water conditions. The tribe is actively developing use support designations, narrative and numeric criteria, and antidegradation standards. A cooperative program with the U.S. Geologic Survey and other agencies has been established to monitor surface and ground water. In 1997, an assessment identifying and quantifying the risk of contamination due to the leaking of underground storage tanks located on and adjacent to the land was completed.

Individual Use Support in Yavapai-Prescott Reservation

Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 4)[b]						
	-	-	-	-	-	-
	-	-	-	-	-	-
	2	-	-	-	100	-

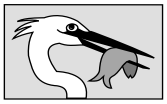
– Not reported in a quantifiable format or unknown.
[a] A subset of Yavapai-Prescott Reservation Indians' designated uses appear in this figure. Refer to the tribe's 305(b) report for a full description of the tribe's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Ed Carney, Fall River Lake, Greenwood County, KS

Interstate Commission Summaries

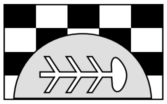
Interstate Commissions provide a forum for joint administration of large waterbodies that flow through or border multiple states and other jurisdictions, such as the Ohio River and the Delaware River and Estuarine System. Each Commission has its own set of objectives and protocols, but the Commissions share a cooperative framework that embodies many of the principles advocated by EPA's watershed management approach. For example, Interstate Commissions can examine and address factors throughout the basin that contribute to water quality problems without facing obstacles imposed by political boundaries. The information presented here summarizes the data submitted by four Interstate Commissions in their 1998 Section 305(b) reports.

Section 305(b) of the CWA requires that the states biennially assess their water quality for attainment of the fishable and swimmable goals of the Act and report the results to EPA. The states, participating tribes, and other jurisdictions measure attainment of the CWA goals by determining how well their waters support their designated beneficial uses. EPA encourages states, tribes, and other jurisdictions to assess waterbodies for support of the following individual beneficial uses:



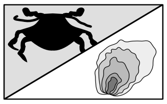
Aquatic Life Support

The waterbody provides suitable habitat for protection and propagation of desirable fish, shellfish, and other aquatic organisms.



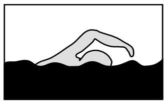
Fish Consumption

The waterbody supports fish free from contamination that could pose a human health risk to consumers.



Shellfish Harvesting

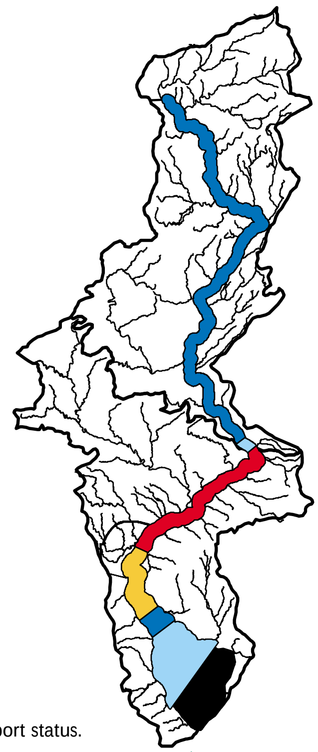
The waterbody supports a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.



Primary Contact Recreation – Swimming

People can swim in the waterbody without risk of adverse human health effects (such as catching waterborne diseases from raw sewage contamination).

Delaware River Basin Commission



This map depicts aquatic life use support status.

For a copy of the Delaware River Basin Commission 1998 305(b) report, contact:

Robert Kausch
Delaware River Basin Commission
P.O. Box 7360
West Trenton, NJ 08628-0360
(609) 883-9500, ext. 252
e-mail: bkausch@drbc.state.nj.us

Also available on DRBC's website at *http://www.state.nj.us/drbc*

Surface Water Quality

The Delaware River Basin covers portions of Delaware, New Jersey, New York, and Pennsylvania. For purposes of the 305(b) report, the Delaware River Basin Commission (DRBC) has jurisdiction over the Delaware River system, which consists of a 206-mile freshwater segment, an 85-mile tidal reach, and the 782-square-mile Delaware Bay. Nearly 8 million people reside in the Basin, which is also the home of numerous industrial facilities and the port facilities of Philadelphia, Camden, and Wilmington.

All of the riverine waters and over 17% of the estuarine waters in the Basin have good water quality that fully supports aquatic life uses. Over 26% percent of the riverine waters do not fully support fish consumption. All riverine waters fully support swimming. Poor water quality impairs shellfishing in over 14% of estuarine assessed waters. Low dissolved oxygen concentrations and toxic contaminants in sediment degrade portions of the lower tidal river and estuary. Toxic contaminants and metals impair a portion of the Delaware River. Shellfishing advisories affect 96 square miles of the Delaware Bay.

In general, water uses received less support during the current reporting period than the previous one. Most of the decreases occurred in the tidal freshwater areas and in Delaware Estuary. Bacterial levels in the tidal freshwater areas were higher, and oxygen levels in both areas were reduced.

Programs to Restore Water Quality

The Delaware River Basin Commission and the states have carried out an aggressive program for many years to reduce point soures of oxygen-demanding materials and other pollutants and will continue to do so. As part of an ongoing effort, DRBC is developing a new model to evaluate the impacts of point and nonpoint pollutants on dissolved oxygen levels.

The Commission has completed Phase 1 of the Estuary Toxics Management Program, which is an interstate cooperative effort to develop water quality criteria, as well as policies and procedures, that will set wasteload allocations and effluent limits for point sources of volatile organics and chronic toxicity. Phase 2 of this program involves the development of wasteload allocations, nonpoint source load allocations, and TMDLs for PCBs, metals, and chlorinated pesticides.

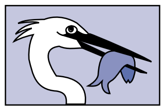
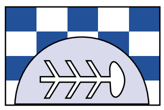
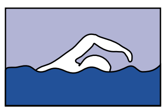
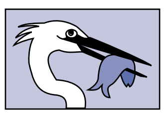
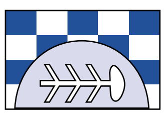
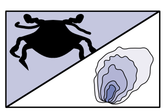
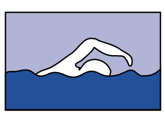
Special Protection Waters regulations protect the upper reaches of the nontidal river from the effects of future population growth and land development through a comprehensive watershed management approach.

Programs to Assess Water Quality

DRBC conducts an intensive monitoring program along the entire length of the Delaware River and Estuary. At least a dozen parameters are sampled at most stations. The Combined Sewer Overflow Study and the Toxics Study have used specialized water sampling programs to acquire data for mathematical models. New management programs will very likely require customized monitoring programs.

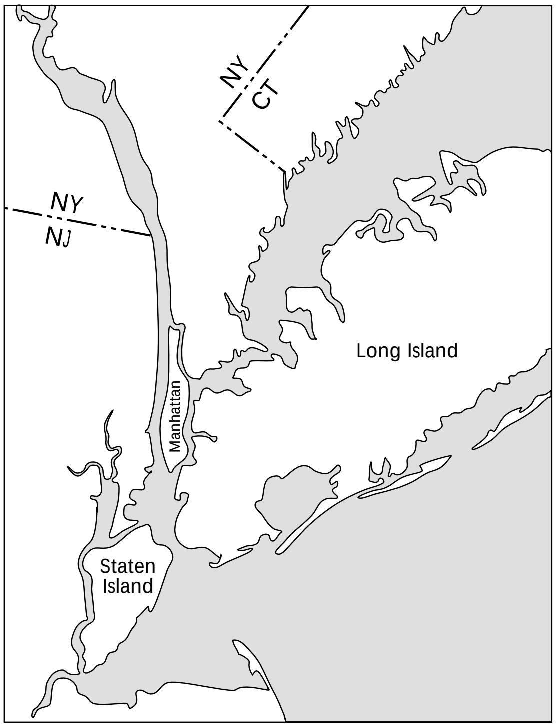
The Commission has begun the preliminary steps to develop a biological monitoring program for the 198-mile long nontidal Delaware River. The purpose of the biological monitoring program is to provide data on various biological communities in order to determine the general condition of the biota and to better understand the interactions between water quality and the biota.

Individual Use Support in the Delaware River

Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 206)						
	206	99	1	0	0	-
	206	74	0	22	4	-
	206	97	3	0	0	-
Estuaries (Total Square Miles = 866)	Total Square Miles Assessed					
	216	17	44	23	16	-
	866	0	0	93	7	-
	679	86	0	5	9	-
	201	96	4	0	0	-

[a] A subset of the Delaware River Basin Commission's designated uses appear in this figure. Refer to the Commission's 305(b) report for a full description of the Commission's uses.

Interstate Sanitation Commission



Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Interstate Sanitation Commission 1998 305(b) report, contact:

Peter L. Sattler or **Howard Golub**
Interstate Sanitation Commission
311 West 43rd Street
New York, NY 10036
(212) 582-0380

Surface Water Quality

Established in 1936 by the Tri-State Compact, which was approved by its member states and the U.S. Congress, the Interstate Sanitation Commission (ISC) is a tri-state environmental agency formed by the states of New York, New Jersey, and Connecticut. The Interstate Sanitation District encompasses approximately 797 square miles of estuarine waters in the Metropolitan Area shared by the states, including the Arthur Kill, Kill Van Kull, Newark Bay, Lower Hudson River, Raritan Bay, Sandy Hook Bay, Upper and Lower New York Bays, Long Island Sound and its embayments, and the Atlantic Ocean.

Notwithstanding the significant environmental gains that have been made in recent years, a tremendous amount of work remains to be done. In the past several years, due to a great degree to ISC's year-round disinfection requirement, which went into effect in July 1,1986, thousands of acres of shellfish beds have been opened on a year-round basis. During the 1996 and 1997 bathing seasons, monitored public bathing beaches in the Interstate Sanitation District were closed for a total of 879 days due to elevated levels of coliform bacteria, urban runoff, combined sewer overflows, and/or wash-ups of debris. Due to a combination of factors including, but not limited to, habitat loss, hypoxia, and overfishing by commercial and recreational interests, bag limits and minimum size restrictions as well as seasonal closures for several finfish species (i.e., flounder, fluke, blackfish, striped bass, and porgy) were promulgated by the states of New York, New Jersey, and Connecticut.

Topics of concern to the Commission include compliance with ISC Water Quality Regulations, toxic contamination of sediments, pollution from combined sewer overflows, maintaining and expanding shellfish harvest waters, operation and maintenance of infrastructure, plant capacity to handle additional waste flows from major development projects, and the need for development of treatment plant process modifications for control of nitrogenous constituents in effluent discharges.

Ground Water Quality

The ISC's primary focus is on estuarine surface waters shared by the states of New York, New Jersey, and Connecticut.

Programs to Restore Water Quality

Through an enforcement program to promote water pollution control and to enhance the quality of the District's surface waters, the ISC continues as an active party in addressing the cause of those conditions that have resulted in continuing contravention of ISC's dissolved oxygen goals. Through its Management Committee and work group activities on the Harbor Estuary Program (HEP) and Long Island Sound Study (LISS), the Commission continues as an active participant in the ongoing effort to identify and address the sources of the problems.

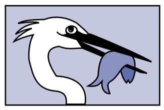
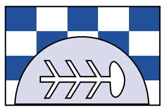
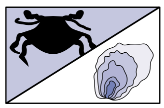
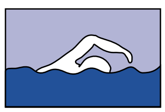
At the request of a coalition of public action groups, ISC participated in discussions with New York City regarding the wastewater flows to the North River WPCP, which is located on the Hudson River. The Commission provided technical expertise on acceptable methods of flow monitoring and recordkeeping.

Programs to Assess Water Quality

The Commission continued its summer surveys by monitoring dissolved oxygen levels in Western Long Island Sound and its embayments. Monitoring of Western Long Island Sound was increased, with five new stations in Little Neck and Manhasset Bays. Microbiological water quality surveys were conducted under worst-case conditions (ebbing high tides associated with a minimum of 0.25 inches of rain) to determine fecal and total coliform bacteria concentrations over the shellfish beds of western Raritan Bay off the coast of Staten Island, New York, and in Little Neck Bay located in Western Long Island Sound to check compliance with the U.S. Food and Drug Administration's National Shellfish Sanitation Program.

Individual Use Support in Interstate Sanitation Commission

Estuaries (Total Square Miles = 992)

Designated Use[a]	Total Square Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
	119	58	28	9	5	0
	992	47	0	50	3	0
	992	42	0	28	30	0
	992	85	1	0	14	0

– Not reported in a quantifiable format or unknown.

[a] A subset of the Interstate Sanitation Commission's designated uses appear in this figure. Refer to the Commission's 305(b) report for a full description of the Commission's uses.

Note: All waters under the jurisdiction of the Interstate Sanitation Commission are estuarine.

Ohio River Valley Water Sanitation Commission (ORSANCO)

Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the ORSANCO 1998 305(b) report, contact:

Jason Heath
ORSANCO
5735 Kellogg Avenue
Cincinnati, OH 45228-1112
(513) 231-7719
e-mail: jheath@orsanco.org

Surface Water Quality

The Ohio River Valley Water Sanitation Commission (ORSANCO) was established in 1948 by the signing of the Ohio River Valley Water Sanitation Compact by Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia, and West Virginia. ORSANCO is an interstate agency with multiple responsibilities that include water quality monitoring and assessment of the Ohio River mainstem, emergency response pollution control standards, and public information/education. The mainstem runs 981 miles from Pittsburgh, Pennsylvania, to Cairo, Illinois.

The most common problems in the Ohio River are PCB and chlordane contamination in fish and bacteria, pesticides, and metals in the water column. The states have issued fish consumption advisories along the entire length of the Ohio River based on ORSANCO data. ORSANCO also suspects that community combined sewer overflows along the entire length of the river elevate bacteria levels and impair swimming. ORSANCO detected bacteria contamination at all six monitoring stations downstream of major urban areas with a large number of combined sewer overflows (CSOs).

ORSANCO used both biological and chemical data to determine aquatic life use support. Assessments of impairment were due to violations of chronic criteria for copper and lead. There was also one location where biological data indicated poor habitat conditions on the mainstem Ohio River near Louisville, Kentucky.

Public water supply use of the Ohio River is impaired by dioxin between Racine and the Big Sandy River and by atrazine downstream of the McAlpine Rock and dam. Atrazine levels prompted water utilities to provide nonroutine treatment.

Ground Water Quality

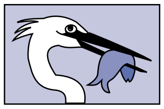
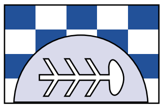
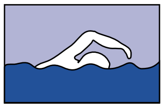
ORSANCO does not have jurisdiction over ground water in the Ohio River Basin.

Programs to Restore Water Quality

In 1992, an interagency workgroup developed a CSO program for the Ohio River Basin with general recommendations to improve coordination of state CSO strategies. In 1993, ORSANCO added requirements for CSOs to the Pollution Control Standards for the Ohio River and the Commissioners adopted a strategy for monitoring CSO impacts on Ohio River quality. The Commission also established a Nonpoint Source Pollution Abatement Task Force composed of ORSANCO Commissioners, representatives from state NPS control agencies, and representatives from industries that generate NPS pollution.

In 1995, an Ohio River Watershed Pollutant Reduction Program was established to address, on a whole-watershed basis, pollutants causing or contributing to water quality impairments. These pollutants include dioxin, PCBs, chlordane, atrazine, copper, lead, nitrogen, and phosphorus. The objective of the program is to determine the extent of impairment, identify sources, quantify impacts, and recommend to the states abatement scenarios necessary to achieve water quality objectives. The program is being implemented following a phased approach without the establishment of new regulatory structures to implement controls that are environmentally meaningful, technically sound, and economically reasonable.

Individual Use Support in the Ohio River Valley Basin

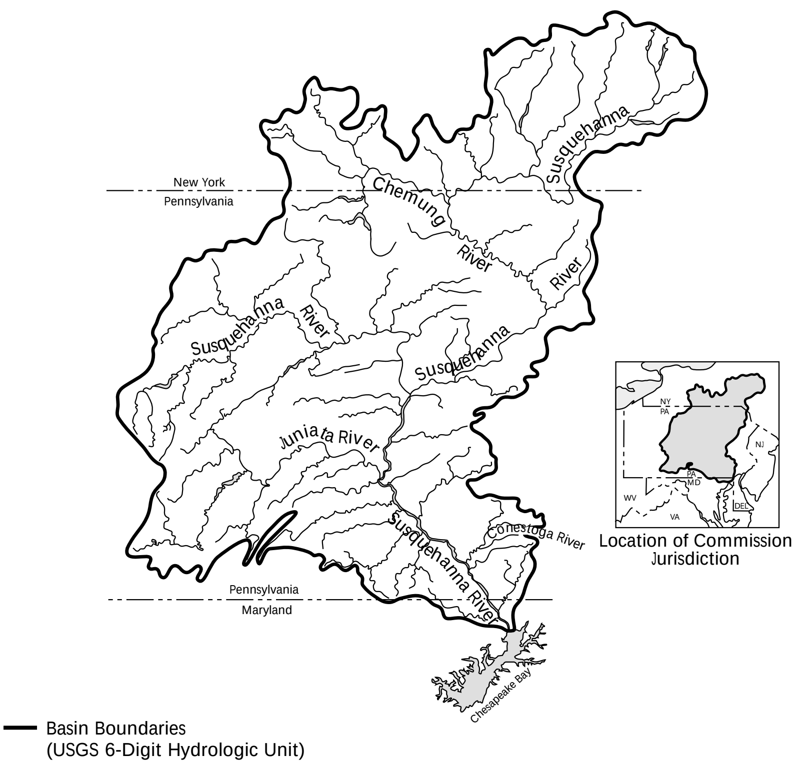
Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 981)[b]						
	947	81	0	19	0	-
	981	0	0	100	0	-
	981	0	0	81	19	-

– Not reported in a quantifiable format or unknown.
[a] A subset of ORSANCO's designated uses appear in this figure. Refer to the Commission's 305(b) report for a full description of the Commission's uses.

Programs to Assess Water Quality

ORSANCO operates a number of monitoring programs on the Ohio River mainstem and several major tributaries, including fixed-station chemical sampling, daily sampling of volatile organic chemicals at water supply intakes, bacterial monitoring, fish tissue sampling, and fish population surveys. ORSANCO uses the Modified Index of Well Being (MIWB) to assess fish community characteristics, such as total biomass and species diversity. ORSANCO is in the process of developing a more suitable index for evaluating fish (and macroinvertebrate) communities.

Susquehanna River Basin Commission



For a copy of the Susquehanna River Basin Commission 1998 305(b) report, contact:

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Harrisburg, PA 17102-2391
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Surface Water Quality

The Susquehanna River drains 27,510 square miles from parts of New York, Pennsylvania, and Maryland and delivers over half of the freshwater entering the Chesapeake Bay. For this 305(b) cycle, the Susquehanna River Basin Commission (SRBC) surveyed 3,520 miles of the 31,193 miles of rivers and streams in the Susquehanna River Basin. Seventy-two percent of the surveyed river miles fully support designated uses, 23% partially support designated uses, and 5% do not support one or more designated uses. Major causes of stream impairment are nutrient enrichment and habitat alteration from agricultural runoff. Other causes of significant stream impairment in the basin include metals, pH, total dissolved solids, and habitat alteration from coal mining activities.

Observed trends in nutrients and sediment water quality in the Susquehanna River at three mainstem stations and three stations at the mouth of major tributaries provide evidence of both improvement or no change in stream quality.

The SRBC did not conduct any lake water quality assessments for this 305(b) cycle. However, a 2-year project funded by EPA and the state of Pennsylvania during past reporting cycles provided an inventory of Pennsylvania lakes that can be used in developing a lake assessment program.

Ground Water Quality

The commission obtains ground water quality information through ground water withdrawal permits, investigations, cooperative studies, and surveys pertaining to existing ground water quality or future ground water quality in the basin. Studies have shown that human-induced problems are generally localized and confined to a small number of wells. Many of the ground water quality problems in the basin are related to naturally dissolved constituents (such as iron, sulfate, and dissolved solids). The SRBC is concerned about ground water contamination from agricultural activities and septic systems, and notes that limited attention is given to the fact that point sources can be sources of ground water recharge and potential contamination.

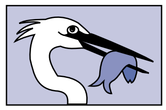
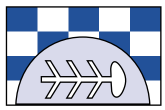
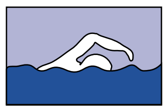
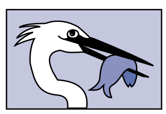
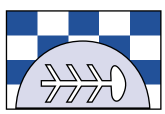
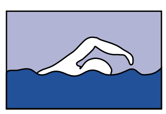
Programs to Restore Water Quality

The SRBC's role is to provide a regional perspective for coordinating local, state, and federal water quality management efforts and promote compliance with established standards. The commission's point source control program objective is to encourage continued upgrading and development of needed public and private waste treatment facilities. SRBC reviews proposed discharge permits and provides comments to permitting agencies on matters within SRBC jurisdiction. The goal of the nonpoint source program is to increase control of stormwater runoff and nonpoint source pollution through the fulfillment of the objectives of the Chesapeake Bay Program.

Programs to Assess Water Quality

The SRBC's monitoring program developed out of its responsibilities and jurisdiction in interstate and regional issues. To support the goals of the Chesapeake Bay Program, the SRBC monitors nitrogen, phosphorus, and sediment in the main-stem Susquehanna River and its major tributaries. The SRBC also established an interstate water quality network to assess compliance with state water quality standards for streams that cross state lines. Finally, regional water quality and biological conditions in the basin are addressed through six subbasin surveys.

Individual Use Support in the Susquehanna River Basin

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Rivers and Streams (Total Miles = 31,193)[b]						
	Total Miles Assessed 3,520	72	-	23	5	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Lakes (Total Acres = 79,687)						
	Total Acres Assessed -	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

– Not reported in a quantifiable format or unknown.
[a] A subset of SRBC's designated uses appear in this figure. Refer to the Commission's 305(b) report for a full description of the Commission's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

1998 National Water Quality Report to Congress Appendices: Contents

Table No.	Sheet Name	File Name	Description	Size Unit
A-1	TableA-1	AppendA.xls	Total Miles of Rivers and Streams in the Nation	Mile
A-2	TableA-2	AppendA.xls	Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Rivers and Streams	Mile
A-3a	TableA-3a	AppendA.xls	Aquatic Life Use Support in Assessed Rivers and Streams	Mile
A-3b	TableA-3b	AppendA.xls	Fish Consumption Use Support in Assessed Rivers and Streams	Mile
A-3c	TableA-3c	AppendA.xls	Swimming Use Support in Assessed Rivers and Streams	Mile
A-3d	TableA-3d	AppendA.xls	Secondary Contact Use Support in Assessed Rivers and Streams	Mile
A-3e	TableA-3e	AppendA.xls	Drinking Water Use Support in Assessed Rivers and Streams	Mile
A-3f	TableA-3f	AppendA.xls	Agriculture Use Support in Assessed Rivers and Streams	Mile
A-4	TableA-4	AppendA.xls	Leading Pollutants and Stressors Impairing Assessed Rivers and Streams	Mile
A-5	TableA-5	AppendA.xls	Leading Sources Impairing Assessed Rivers and Streams	Mile
B-1	TableB-1	AppendB.xls	Total Lake, Reservoir, and Pond Acres in the Nation	Acre
B-2	TableB-2	AppendB.xls	Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Lakes, Reservoirs, and Ponds	Acre
B-3a	TableB-3a	AppendB.xls	Aquatic Life Use Support in Assessed Lakes, Reservoirs, and Ponds	Acre
B-3b	TableB-3b	AppendB.xls	Fish Consumption Use Support in Assessed Lakes, Reservoirs, and Ponds	Acre
B-3c	TableB-3c	AppendB.xls	Swimming Use Support in Assessed Lakes, Reservoirs, and Ponds	Acre
B-3d	TableB-3d	AppendB.xls	Secondary Contact Use Support in Assessed Lakes, Reservoirs, and Ponds	Acre
B-3e	TableB-3e	AppendB.xls	Drinking Water Use Support in Assessed Lakes, Reservoirs, and Ponds	Acre
B-3f	TableB-3f	AppendB.xls	Agriculture Use Support in Assessed Lakes, Reservoirs, and Ponds	Acre
B-4	TableB-4	AppendB.xls	Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds	Acre
B-5	TableB-5	AppendB.xls	Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds	Acre
C-1	TableC-1	AppendC.xls	Total Estuarine and Ocean Shoreline Waters in the Nation	Sq. Mi/Mile
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C-3b	TableC-3b	AppendC.xls	Fish Consumption Use Support in Assessed Estuaries	Sq. Mile
C-3c	TableC-3c	AppendC.xls	Shellfishing Use Support in Assessed Estuaries	Sq. Mile
C-3d	TableC-3d	AppendC.xls	Swimming Use Support in Assessed Estuaries	Sq. Mile
C-3e	TableC-3e	AppendC.xls	Secondary Contact Use Support in Assessed Estuaries	Sq. Mile
C-4	TableC-4	AppendC.xls	Leading Pollutants and Stressors Impairing Assessed Estuaries	Sq. Mile
C-5	TableC-5	AppendC.xls	Leading Sources Impairing Assessed Estuaries	Sq. Mile
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C-7a	TableC-7a	AppendC.xls	Aquatic Life Use Support in Assessed Ocean Shoreline Waters	Mile
C-7b	TableC-7b	AppendC.xls	Fish Consumption Use Support in Assessed Ocean Shoreline Waters	Mile
C-7c	TableC-7c	AppendC.xls	Shellfishing Use Support in Assessed Ocean Shoreline Waters	Mile

Table No.	Sheet Name	File Name	Description	Size Unit
C-7d	TableC-7d	AppendC.xls	Swimming Use Support in Assessed Ocean Shoreline Waters	Mile
C-7e	TableC-7e	AppendC.xls	Secondary Contact Use Support in Assessed Ocean Shoreline Waters	Mile
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C-9	TableC-9	AppendC.xls	Leading Sources Impairing Assessed Ocean Shoreline Waters	Mile
D-1	TableD-1	AppendD.xls	Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Wetlands	Acre
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F-3b	TableF-3b	AppendF.xls	Fish Consumption Use Support in Assessed Great Lakes Shoreline	Mile
F-3c	TableF-3c	AppendF.xls	Swimming Use Support in Assessed Great Lakes Shoreline	Mile
F-3d	TableF-3d	AppendF.xls	Secondary Contact Use Support in Assessed Great Lakes Shoreline	Mile
F-3e	TableF-3e	AppendF.xls	Drinking Water Use Support in Assessed Great Lakes Shoreline	Mile
F-3f	TableF-3f	AppendF.xls	Agriculture Use Support in Assessed Great Lakes Shoreline	Mile
F-4	TableF-4	AppendF.xls	Leading Pollutants and Stressors Impairing Assessed Great Lakes Shoreline	Mile
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G-1	TableG-1	AppendG.xls	Summary of State Bioassessment Programs (includes 50 States, the Ohio River Valley Sanitation Commission, and District of Columbia)	Count
H-1	TableH-1	AppendH.xls	Trophic Status of Assessed Significant Publicly Owned Lakes	Acre
H-2	TableH-2	AppendH.xls	Acidity in Asssessed Significant Publicly Owned Lakes	Acre
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H-4	TableH-4	AppendH.xls	Trends in Asssessed Significant Publicly Owned Lakes	Acre
H-5	TableH-5	AppendH.xls	1996-1997 Clean Lakes Program Projects	Count

Appendix A-1. Total Miles of Rivers and Streams in the Nation

Jurisdiction	Total Miles	Perennial Miles	Nonperennial Miles	Canal and Ditch Miles	Assessed Miles	Percent Assessed	Comment
Agua Caliente Band	73	19	54	0	67	92%	
Alabama	77,274	47,072	30,170	32	3,995	5%	
Alaska	365,000				513	0%	Entered estimate of total river miles from 1994 305(b) report.
Arizona	90,373	3,528	86,845		4,246	5%	Arizona does not include river miles on Indian lands in their estimate of total river miles.
Arkansas	87,617	28,408	53,465	5,251	8,513	10%	Arkansas reports the RF3 estimates of toral river miles in their atlas, but the state uses the RF1 estimate of 11,915 miles.
Augustine Band	2	0	0	2	2	100%	
California	211,513	64,438	124,615	22,059	17,479	8%	
Colorado	107,403	29,553			29,363	27%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Connecticut	5,830	5,484	344	2	948	16%	
Cortina Rancheria	6.9	2.0	4.9	0.0	6.9	100%	
Coyote Valley Reservation	0.56	0.36	0.20	0.00	0.52	93%	
Delaware	2,509	1,778	405	326	2,379	95%	
Delaware River	206	206			206	100%	The Delaware River Basin Commission's 305(b) report covers only the Delaware River mainstem, although the DRBC has juridisdiction over the entire basin.
District of Columbia	39	39	0	0	38	98%	
Florida	51,858	22,993	2,956	25,909	5,271	10%	
Georgia	70,150	44,056	23,906	603	8,573	12%	
Guam	228	97			0	0%	
Hawaii	3,905	249			3,905	100%	Entered surveyed miles, a subset of total river miles, because Hawaii reported that the total miles of rivers was not known.
Idaho	115,595	54,948	52,704	7,944	12,280	11%	
Illinois	87,110	30,246	54,741	1,034	28,448	33%	
Indiana	35,673	20,365			8,400	24%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Iowa	71,665	26,630	42,957	1,418	9,755	14%	
Kansas	134,338	23,731	110,225	382	15,620	12%	
Kentucky	49,105	34,152			9,232	19%	Excludes the Ohio River mainstem. Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
La Jolla Band of Indians	36.3	3.9	31.3	1.1	7.8	21%	
Louisiana	66,294	32,955	20,667	12,672	5,939	9%	
Maine	31,752	23,457			31,752	100%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Manzanita Band	11.2	3.4	7.8	0.0	7.3	65%	

Appendix A-1. Total Miles of Rivers and Streams in the Nation

Jurisdiction	Total Miles	Perennial Miles	Nonperennial Miles	Canal and Ditch Miles	Assessed Miles	Percent Assessed	Comment
Maryland	17,000	12,343	2,104	161	6,684	39%	Maryland uses 17,000 miles as a baseline river length. This approximation is based on an aggregated estimate of stream density for each county.
Massachusetts	8,229	6,808			1,495	18%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Michigan	51,438	28,719			20,575	40%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Minnesota	91,944	32,196			12,256	13%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Mississippi	84,003	26,454	54,862	2,687	39,080	47%	
Missouri	51,978	21,978	30,000		21,585	42%	Missouri uses the 21,997.8 miles of classified perennial streams to determine the percent of rivers assessed.
Montana	176,750	53,221	116,608	6,921	17,874	10%	
N Mariana Islands	59	11	48		0	0%	
Nebraska	81,573	17,783	62,958	2,517	3,903	5%	
Nevada	143,578	14,988	126,257	1,782	1,639	1%	
New Hampshire	10,881	8,636	2,238	7	2,580	24%	
New Jersey	6,450	6,450			3,815	59%	The 3815 miles were assessed using benthic macroinvertebrate populations. These miles overlap with 390 miles assessed for swimming.
New Mexico	110,741	8,682	99,332	2,727	3,882	4%	Mileage estimates from EPA's Total Waters database. New Mexico estimates approximately 6,000 miles of perennial rivers and streams.
New York	52,337	46,266	5,075	547	52,337	100%	New York includes unassessed waters in their estimate of fully supporting miles.
North Carolina	37,853	45,571			33,533	89%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
North Dakota	54,373	5,483	48,890		11,866	22%	North Dakota stream classes are defined in the State Water Quality Standards. In general, Classes I, IA, and II streams are perennial, while Class III are intermittent or ephemeral.
Ohio	29,113	27,825			3,023	10%	
Ohio River Valley	981	981	0	0	981	100%	
Oklahoma	78,778	22,386	55,413	175	11,353	14%	
Oregon	114,823	51,695	59,299	3,829	53,735	47%	
Pennsylvania	83,260	39,179			12,902	15%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Puerto Rico	5,385	4,539	854		5,385	100%	
Rhode Island	1,392	887			755	54%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.

Appendix A-1. Total Miles of Rivers and Streams in the Nation

Jurisdiction	Total Miles	Perennial Miles	Nonperennial Miles	Canal and Ditch Miles	Assessed Miles	Percent Assessed	Comment
South Carolina	29,898	24,115			19,524	65%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
South Dakota	9,937	1,932	8,005	424	3,200	32%	
Tennessee	61,075	53,872			53,507	88%	Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Texas	191,228	40,194	144,603	6,431	13,820	7%	
Torres-Martinez Desert Band	77	0	25	52	52	67%	
Twenty-Nine Palms Band	3.1	1.0	2.1	0.0	1.0	32%	The perennial flow in the Coachella Valley Stormwater Channel results from a WWTP discharge.
Utah	85,916	16,457	65,442	4,017	8,781	10%	
Vermont	7,099	6,958			1,157	16%	As part of its rotational watershed assessment strategy, VT reported only on rivers and streams in 3 major river basins for this report. Entered perennial mileage estimate from EPA's Total Waters Database because the state did not report an estimate.
Virginia	49,350	49,350	0	0	19,260	39%	Entered perennial river miles, a subset of total river miles, because the state did not report total miles.
Washington	70,439	39,483			69,317	98%	Entered perennial mileage estimate from EPA's Total State Waters Report (1991) because the state did not report an estimate.
West Virginia	32,278	21,114	11,164	18	7,854	24%	In their 305(b) report, West Virginia reported only on rivers and streams assessed for the 1998 cycle. The data presented here include some assessments done prior to the 1998 cycle.
Wisconsin	57,698	32,010	23,777	814	23,306	40%	
Wyoming	108,767	35,151	73,616		94,460	87%	
Yavapai-Prescott Reservatior	4.2	2.1	2.1	0.0	2.1	50%	
Total	3,662,255	1,298,134	1,594,672	110,744	842,426		
		35%	44%	3%	23%		

Appendix A-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Rivers and Streams

Jurisdiction	Full Support - Evaluated	Full Support - Monitored	Full Support - Not Specified	Full Support - Total	Threatened - Evaluated	Threatened - Monitored	Threatened - Not Specified	Threatened - Total	Impaired - Evaluated	Impaired - Monitored	Impaired - Not Specified	Impaired - Total
Agua Caliente Band			67	67			0	0			0	0
Alabama	1,173	2,603	0	3,776				0	119	101	0	220
Alaska	3	0	0	3				0	92	419	0	510
Arizona	1,475	775	0	2,250	320	39	0	359	796	841	0	1,637
Arkansas	2,265	3,077	0	5,341				0	34	1,113	0	1,147
Augustine Band			0.0	0.0			0.0	0.0			2.1	2.1
California	2,264	1,080	0	3,344	1,535	336	0	1,871	5,543	6,722	0	12,265
Colorado			28,083	28,083				0			1,280	1,280
Connecticut	61	316	0	377	140	165	0	305	27	237	0	264
Cortina Rancheria	0.0	0.0	0.0	0.0	0.0	4.9	0.0	4.9	0.0	2.0	0.0	2.0
Coyote Valley Reservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.12	0.00	0.52
Delaware	0	0	0	0	0	0	0	0	125	2,253	0	2,379
Delaware River	0	150	0	150	0	2	0	2	54	0	0	54
District of Columbia	0	0	0	0	0	0	0	0	0	38	0	38
Florida	0	2,766	0	2,766	0	177	0	177	0	2,329	0	2,329
Georgia	1,096	2,279	0	3,375				0	1,167	4,031	0	5,198
Guam				0				0				0
Hawaii	1,194	6	0	1,201	0	0	0	0	2,604	100	0	2,704
Idaho	0	3,384	0	3,384	669	0	0	669	0	8,227	0	8,227
Illinois	9,428	6,252	0	15,680	82	128	0	210	7,215	5,343	0	12,558
Indiana	0	3,970	0	3,970	0	430	0	430	0	4,000	0	4,000
Iowa	285	837	0	1,122	2,149	4,220	0	6,368	813	1,451	0	2,265
Kansas	477	4,435	0	4,912	0	0	0	0	1,238	9,470	0	10,708
Kentucky	1,774	4,158	0	5,931	92	133	0	225	1,004	2,072	0	3,076
La Jolla Band of Indians			0.0	0.0			7.8	7.8			0	0
Louisiana	195	376	0	571	61	0	0	61	691	4,617	0	5,307
Maine	21,541	9,667	0	31,208	0	0	0	0	111	433	0	544
Manzanita Band			0.0	0.0			5.8	5.8			1.5	1.5
Maryland	0	6,306	0	6,306				0	0	378	0	378
Massachusetts	336	137	0	473	15	36	0	51	561	410	0	971
Michigan	0	18,833	0	18,833	0	38	0	38	0	1,704	0	1,704
Minnesota	35	1,087	0	1,121	1,745	1,759	0	3,504	5,593	1,956	0	7,550
Mississippi	188	547	0	736	220	440	0	659	35,990	1,641	0	37,632
Missouri	8,262	2,870	0	11,132	89	171	0	260	6,536	3,657	0	10,193
Montana	2,084	1,292	0	3,376	2,749	1,168	0	3,917	6,671	3,910	0	10,581
N Mariana Islands	0	0	0	0	0	0	0	0	0	0	0	0
Nebraska	545	1,215	0	1,760	54	480	0	534	330	1,279	0	1,609

Appendix A-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Rivers and Streams

Jurisdiction	Not Attainable - Evaluated	Not Attainable - Monitored	Not Attainable - Not Specified	Not Attainable - Total	Total Evaluated	Total Monitored	Total Unspecified	Total Assessed	Comment
Agua Caliente Band				0	0	0	67	67	Entered aquatic life use support in lieu of summary use support.
Alabama				0	1,292	2,704	0	3,995	State reported overall use support status.
Alaska				0	95	419	0	513	State reported overall use support status. Alaska's assessment data is biased towards those waters with known impairment; efforts are underway to assess other waters across the state.
Arizona				0	2,591	1,655	0	4,246	
Arkansas				0	2,299	4,190	0	6,488	State listed 2213.2 river miles as "waters of concern." Some waters were listed in both the nonsupport and "waters of concern" category.
Augustine Band				0.0	0.0	0.0	2.1	2.1	
California				0	9,341	8,138	0	17,479	
Colorado				0	0	0	29,363	29,363	
Connecticut	3	0	0	3	230	718	0	948	State reported overall use support status. Excludes the effect of a statewide fish consumption advisory for mercury.
Cortina Rancheria	0.0	0.0	0.0	0.0	0.0	6.9	0.0	6.9	
Coyote Valley Reservation	0.00	0.00	0.00	0.00	0.40	0.12	0.00	0.52	The Coyote Valley Tribe notes that more vineyard planting upstream is increasing water withdrawal from Forsythe Creek and Russian River.
Delaware				0	125	2,253	0	2,379	
Delaware River				0	54	152	0	206	
District of Columbia				0	0	38	0	38	
Florida				0	0	5,271	0	5,271	State reported overall use support status.
Georgia				0	2,263	6,310	0	8,573	
Guam				0	0	0	0	0	
Hawaii				0	3,798	106	0	3,905	
Idaho				0	669	11,611	0	12,280	
Illinois				0	16,725	11,723	0	28,448	State reported overall use support status.
Indiana	0	0	0	0	0	8,400	0	8,400	
Iowa				0	3,247	6,508	0	9,755	
Kansas	0	0	0	0	1,715	13,905	0	15,620	
Kentucky	0	0	0	0	2,870	6,363	0	9,232	Excludes the Ohio River mainstem.
La Jolla Band of Indians				0	0.0	0.0	7.8	7.8	Entered swimming use support in lieu of summary use support.
Louisiana				0	947	4,992	0	5,939	
Maine				0	21,652	10,100	0	31,752	
Manzanita Band				0.0	0.0	0.0	7.3	7.3	Entered swimming use support in lieu of summary use support.
Maryland				0	0	6,684	0	6,684	
Massachusetts	0	0	0	0	912	583	0	1,495	
Michigan				0	0	20,575	0	20,575	State reported overall use support status.
Minnesota	81	0	0	81	7,455	4,802	0	12,256	
Mississippi	54	0	0	54	36,453	2,628	0	39,080	
Missouri				0	14,887	6,698	0	21,585	
Montana				0	11,504	6,370	0	17,874	Entered aquatic life use support in lieu of summary use support.
N Mariana Islands				0	0	0	0	0	
Nebraska				0	929	2,974	0	3,903	

Appendix A-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Rivers and Streams

Jurisdiction	Full Support - Evaluated	Full Support - Monitored	Full Support - Not Specified	Full Support - Total	Threatened - Evaluated	Threatened - Monitored	Threatened - Not Specified	Threatened - Total	Impaired - Evaluated	Impaired - Monitored	Impaired - Not Specified	Impaired - Total
Nevada	166	698	0	864				0	28	748	0	775
New Hampshire	1,811	359	0	2,170				0	251	158	0	409
New Jersey	0	1,350	0	1,350				0	0	2,465	0	2,465
New Mexico	899	549	0	1,447				0	1,273	1,162	0	2,435
New York	49,322	0	0	49,322	1,987	0	0	1,987	1,028	0	0	1,028
North Carolina	12,182	5,166	0	17,348	8,506	3,115	0	11,621	2,041	2,522	0	4,563
North Dakota	584	443	0	1,026	5,127	981	0	6,108	2,195	2,537	0	4,732
Ohio			1,403	1,403			344	344			1,277	1,277
Ohio River Valley	0	0	0	0	0	0	0	0	0	981	0	981
Oklahoma	270	694	0	963	1,630	1,282	0	2,912	1,750	5,727	0	7,478
Oregon	10,605	5,687	0	16,292	23,506	0	0	23,506	0	13,937	0	13,937
Pennsylvania	0	0	8,495	8,495				0	0	0	4,407	4,407
Puerto Rico	639	0	0	639	3,640	0	0	3,640	0	1,106	0	1,106
Rhode Island	52	83	0	135	99	245	0	345	17	259	0	276
South Carolina	0	4,959	0	4,959				0	0	14,564	0	14,564
South Dakota	0	1,158	0	1,158				0	0	2,042	0	2,042
Tennessee	0	0	38,480	38,480				0	0	0	15,027	15,027
Texas	0	9,530	0	9,530	0	0	0	0	0	4,290	0	4,290
Torres-Martinez Desert Band			0	0			0	0			52	52
Twenty-Nine Palms Band			0	0			0	0			1	1
Utah	113	5,855	0	5,968				0	6	2,809	0	2,815
Vermont			707	707			270	270			180	180
Virginia	903	7,684	0	8,587	898	7,164	0	8,062	5	2,605	0	2,611
Washington	0	28,164	0	28,164				0	0	41,153	0	41,153
West Virginia	21	2,181	0	2,203	3	1,075	0	1,077	56	4,517	0	4,573
Wisconsin	5,825	1,565	0	7,390	4,329	1,231	0	5,560	6,240	4,102	0	10,342
Wyoming	90,823	2,772	0	93,595	380	75	0	455	335	75	0	410
Yavapai-Prescott Reservation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	2.1
Total	228,894	157,313	77,234	463,441	60,023	24,893	627	85,544	92,540	176,496	22,227	291,264
	27%	19%	9%	55%	7%	3%	0%	10%	11%	21%	3%	35%

Appendix A-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Rivers and Streams

Jurisdiction	**Not Attainable - Evaluated**	**Not Attainable - Monitored**	**Not Attainable - Not Specified**	**Not Attainable - Total**	**Total Evaluated**	**Total Monitored**	**Total Unspecified**	**Total Assessed**	**Comment**
Nevada				0	194	1,445	0	1,639	
New Hampshire	0	0	0	0	2,063	517	0	2,580	New Hampshire's analysis excludes the effect of a statewide fish consumption advisory for mercury.
New Jersey				0	0	3,815	0	3,815	Entered aquatic life use support in lieu of summary use support.
New Mexico	0	0	0	0	2,171	1,711	0	3,882	State reported overall use support status. Of the "fully supporting" miles, 496 miles were reported as "fully supporting, impacts observed."
New York				0	52,337	0	0	52,337	New York includes unassessed waters in their estimate of fully supporting miles.
North Carolina				0	22,729	10,803	0	33,532	
North Dakota				0	7,906	3,961	0	11,866	
Ohio				0	0	0	3,023	3,023	Entered aquatic life use support in lieu of summary use support.
Ohio River Valley				0	0	981	0	981	ORSANCO notes that 981 miles are not impaired for all uses.
Oklahoma				0	3,650	7,703	0	11,353	
Oregon				0	34,111	19,624	0	53,735	
Pennsylvania				0	0	0	12,902	12,902	Pennsylvania's data is mainly based on monitored records, although some evaluated records were used if segments were on previous 303(d) lists.
Puerto Rico	0	0	0	0	4,279	1,106	0	5,385	
Rhode Island	0	0	0	0	168	587	0	755	
South Carolina				0	0	19,524	0	19,524	South Carolina included the effects of a statewide fish consumption advisory for mercury in those basins assessed during 1996 and 1997, but did not for those basins assessed previously.
South Dakota				0	0	3,200	0	3,200	
Tennessee				0	0	0	53,507	53,507	
Texas	0	0	0	0	0	13,820	0	13,820	
Torres-Martinez Desert Band				0	0	0	52	52	
Twenty-Nine Palms Band				0	0	0	1	1	
Utah	0	0	0	0	119	8,664	0	8,783	
Vermont				0	0	0	1,157	1,157	State reported overall use support status. Excludes the effect of a statewide fish consumption advisory for mercury.
Virginia				0	1,807	17,453	0	19,260	
Washington				0	0	69,317	0	69,317	State reported overall use support status.
West Virginia	1	0	0	1	81	7,773	0	7,854	
Wisconsin	12	3	0	15	16,405	6,901	0	23,306	
Wyoming	0	0	0	0	91,538	2,922	0	94,460	
Yavapai-Prescott Reservation				0.0	0.0	2.1	0.0	2.1	Entered swimming use support in lieu of summary use support.
Total	151	3	0	154	381,608	358,705	100,089	840,402	
	0%	0%	0%	0%	45%	43%	12%		

Appendix A-3a. Aquatic Life Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Agua Caliente Band	67	0	0	0		67	
Alabama						0	
Alaska						0	
Arizona	2,270	286	872	692		4,120	Entered "aquatic and wildlife overall" use support status.
Arkansas	5,906		1,890	718		8,513	Arkansas reports on "waters of concern." These were entered as "partial support."
Augustine Band	0.0	2.1	0.0	0.0		2.1	
California	2,963	1,422	5,970	1,934		12,289	
Colorado	28,093		1,065	205		29,363	
Connecticut	514	271	135	26	3	948	
Cortina Rancheria	0.0	2.0	0.0	0.0	0.0	2.0	
Coyote Valley Reservation	0.00	0.12	0.40	0.00	0.00	0.52	
Delaware	433		500	1,577		2,510	
Delaware River	204	2	0	0		206	
District of Columbia	0	0	17	22		38	
Florida	2,634	177	1,811	326		4,947	
Georgia	3,375		1,831	980		6,186	
Guam						0	
Hawaii	1,566	0	0	2,339	0	3,905	
Idaho						0	
Illinois	15,659	216	12,312	261		28,448	
Indiana	5,392	419	720	808	0	7,339	
Iowa	1,073	6,566	1,745	36		9,418	
Kansas	11,342	0	2,876	1,402	0	15,620	
Kentucky	5,963	264	997	1,052		8,276	Excludes the Ohio River mainstem.
La Jolla Band of Indians						0	
Louisiana	784	109	1,698	3,258		5,848	Entered "fish and wildlife propogation" use support status.
Maine	31,404	0	49	299		31,752	
Manzanita Band						0	
Maryland	6,306		334	42		6,682	
Massachusetts	699	97	134	396	0	1,325	
Michigan	20,007			568		20,575	
Minnesota	1,026	4,988	1,633	4,251	81	11,979	
Mississippi	833	1,148	36,471	205	54	38,711	
Missouri	11,485		9,836	264		21,585	
Montana	3,377	3,917	9,215	1,365		17,874	
N Mariana Islands						0	
Nebraska	1,987	513	611	153		3,264	
Nevada	830		692	109		1,631	
New Hampshire	2,407		128	7	0	2,542	New Hampshire assessed 2542.0 miles for this use.
New Jersey	1,350		2,000	465		3,815	

Appendix A-3a. Aquatic Life Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
New Mexico	1,128		1,304	1,563	0	3,995	Of the "fully supporting" miles, 376.9 miles were reported as "fully supporting, impacts observed."
New York	50,938	1,025	315	59		52,337	
North Carolina						0	
North Dakota	1,096	7,407	3,091	313		11,907	
Ohio	1,403	344	614	662		3,023	
Ohio River Valley	770	0	177	0		947	
Oklahoma	1,468	2,628	1,660	5,332		11,088	
Oregon	16,292	23,506	0	13,937		53,735	
Pennsylvania	8,495			4,407		12,902	Pennsylvania assumes aquatic life use support also includes other uses.
Puerto Rico	749	3,620	12	1,004	0	5,385	Entered "propogation and preservation of desirable species" use support status.
Rhode Island	165	361	130	65		721	
South Carolina	17,009		767	1,748		19,524	
South Dakota	1,062		617	1,307	0	2,986	
Tennessee	39,003		11,248	3,256		53,507	
Texas	12,440	0	395	757	42	13,634	
Torres-Martinez Desert Band	2	50	0	0		52	
Twenty-Nine Palms Band	0	1	0	0		1	
Utah	7,148		1,050	508	0	8,705	
Vermont	784	239	94	40		1,157	
Virginia	8,736	10,455	1,021	394		20,606	
Washington	43,875		14,239	11,203		69,317	
West Virginia	2,995	1,056	3,024	867	1	7,943	
Wisconsin	7,148	5,681	8,244	1,752	29	22,854	
Wyoming	18,132	455	335	75	1,191	20,188	
Yavapai-Prescott Reservation						0	Category not applicable.
Total	410,784	77,224	143,878	73,004	1,402	706,291	
	58%	11%	20%	10%	0%		

Appendix A-3b. Fish Consumption Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Agua Caliente Band						0	
Alabama						0	
Alaska						0	
Arizona	3,325	215	37	126		3,703	
Arkansas	8,081		2	431		8,513	Arkansas reports on "waters of concern." These were entered as "partial support."
Augustine Band						0.0	
California	2,347	739	4,795	193		8,075	
Colorado						0	
Connecticut	803	0	95	50	0	948	Excludes the effect of a statewide fish consumption advisory for mercury.
Cortina Rancheria						0	
Coyote Valley Reservation	0.00	0.12	0.40	0.00	0.00	0.52	
Delaware						0	
Delaware River	152	0	46	8		206	
District of Columbia	0	0	0	24		24	
Florida	0	0	615	157		772	
Georgia						0	
Guam						0	
Hawaii	3,878	0	0	13	0	3,892	
Idaho						0	
Illinois	3,061	0	0	718		3,779	
Indiana	0	0	2,551	478	0	3,029	
Iowa	1,516	292	0	11		1,819	
Kansas	604	0	0	232	0	836	
Kentucky	1,532	0	4	123		1,659	Excludes the Ohio River mainstem.
La Jolla Band of Indians						0	
Louisiana						0	
Maine	31,481	0	199	72		31,752	
Manzanita Band						0	
Maryland	17,000		0	0		17,000	
Massachusetts	269	0	0	410	0	679	
Michigan	19,711			865		20,576	
Minnesota						0	
Mississippi	447	263	228	23	0	961	
Missouri	21,856		0	122		21,978	
Montana						0	
N Mariana Islands						0	
Nebraska	968	882	0	0		1,850	
Nevada						0	
New Hampshire	0		265	13	0	279	Excludes the effects of a statewide fish consumption advisory for mercury. New Hampshire assessed 278.8 miles for this use.
New Jersey						0	

Appendix A-3b. Fish Consumption Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
New Mexico	0		93	0	0	93	
New York	51,975	0	281	82		52,337	
North Carolina						0	
North Dakota	0	0	147	0		147	
Ohio						0	
Ohio River Valley	0	0	981	0		981	
Oklahoma						0	
Oregon	84	103	0	797		984	
Pennsylvania						0	
Puerto Rico						0	
Rhode Island						0	
South Carolina	0		8,397	0		8,397	
South Dakota	170					170	
Tennessee	53,365			142		53,507	
Texas	146	0	63	236	0	445	
Torres-Martinez Desert Band						0	
Twenty-Nine Palms Band						0	
Utah	0		0	16	0	16	
Vermont	1,041	7	100	9		1,156	
Virginia	48,911	44	189	80		49,224	
Washington	39,274		238	19,526		59,039	
West Virginia	142	0	203	4	0	349	
Wisconsin	2,833	112	686	139	8	3,778	
Wyoming	18,997	0	0	0	0	18,997	
Yavapai-Prescott Reservation						0	Category not applicable.
Total	333,970	2,656	20,218	25,100	8	381,952	
	87%	1%	5%	7%	0%		

Appendix A-3c. Swimming Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Agua Caliente Band						0	
Alabama						0	
Alaska						0	
Arizona	3,132	275	211	57		3,675	
Arkansas	6,973		489	13		7,475	Arkansas reports on "waters of concern." These were entered as "partial support."
Augustine Band	0.0	0.0	0.0	2.1		2.1	
California	2,918	1,303	5,784	2,061		12,066	
Colorado			106	16	18,830	18,952	All Colorado's rivers marked not attainable for swimming were not necessarily surveyed.
Connecticut	639	86	153	67	3	948	
Cortina Rancheria						0	
Coyote Valley Reservation	0.00	0.40	0.00	0.12	0.00	0.52	
Delaware	41		450	1,514		2,005	
Delaware River	200	6	0	0		206	
District of Columbia	0	0	0	28		28	
Florida	2,634	177	1,811	326		4,947	
Georgia	3,375		960	1,016		5,351	
Guam						0	
Hawaii	3,897	0	0	1	0	3,898	
Idaho						0	
Illinois	795	0	778	1,929		3,502	
Indiana	3,147	60	179	690	0	4,076	
Iowa	121	296	359	137		913	
Kansas					1,697	1,697	Category not applicable
Kentucky	538	77	504	1,391		2,510	Excludes the Ohio River mainstem.
La Jolla Band of Indians	0.0	7.8	0.0	0.0		7.8	
Louisiana	2,778	74	229	2,495		5,576	
Maine	31,508	0	102	141		31,752	
Manzanita Band	0.0	5.8	0.0	1.5		7.3	
Maryland	16,995		1	4		17,000	
Massachusetts	468	28	309	278	0	1,082	
Michigan	20,107			468		20,575	
Minnesota	1,941	0	669	4,667	81	7,359	
Mississippi	139	172	11,145	537	0	11,994	
Missouri	5,364		0	48		5,412	
Montana						0	
N Mariana Islands						0	
Nebraska	148	7	335	1,326		1,816	
Nevada	1,337		181	25		1,542	

Appendix A-3c. Swimming Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
New Hampshire	2,478		50	39	0	2,566	New Hampshire assessed 2566.4 miles for this use.
New Jersey	100		120	170		390	
New Mexico	4,103		16	15	0	4,134	Of the "fully supporting" miles, 15.3 miles were reported as "fully supporting, impacts observed."
New York	52,254	30	14	39		52,337	
North Carolina						0	
North Dakota	1,440	4,547	2,641	214		8,842	
Ohio						0	
Ohio River Valley	0	0	797	184		981	
Oklahoma	702	2,146	1,139	695		4,682	
Oregon	2,777	48	0	2,237		5,062	
Pennsylvania						0	
Puerto Rico	748	3,537	18	1,078	4	5,385	The 3.6 miles listed as not attainable are underground river segments where swimming cannot be attained.
Rhode Island	349	249	27	49		674	
South Carolina	10,239		4,171	5,018		19,428	
South Dakota	238		64	348	0	650	
Tennessee	51,785		635	1,198		53,618	Entered "recreation" use support status.
Texas	9,905	0	952	2,619	29	13,505	
Torres-Martinez Desert Band	0	0	0	52		52	
Twenty-Nine Palms Band	0	0	0	1		1	
Utah	508		0	10	0	518	
Vermont	867	153	98	39		1,157	
Virginia	5,742	1,115	876	559		8,292	
Washington	39,711		9,488	20,117		69,317	
West Virginia	5,572	839	608	821	1	7,841	
Wisconsin						0	
Wyoming						0	
Yavapai-Prescott Reservatior	0.0	0.0	0.0	2.1		2.1	
Total	298,713	15,239	46,469	54,741	20,645	435,807	
	69%	3%	11%	13%	5%		

Appendix A-3d. Secondary Contact Recreational Use in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Agua Caliente Band						0	
Alabama						0	
Alaska						0	
Arizona	183	1	40	75		299	
Arkansas	8,513		0	0		8,513	Arkansas reports on "waters of concern." These were entered as "partial support."
Augustine Band	0.0	0.0	0.0	2.1		2.1	
California	3,438	1,227	5,536	1,896		12,096	
Colorado						0	
Connecticut						0	
Cortina Rancheria	0.0	0.0	2.0	0.0	0.0	2.0	
Coyote Valley Reservation	0.00	0.00	0.00	0.00	0.52	0.52	
Delaware	2,509		0	0		2,509	
Delaware River	206	0	0	0		206	
District of Columbia	1	0	4	23		28	
Florida	2,634	177	1,811	326		4,947	
Georgia	3,375		0	0		3,375	
Guam						0	
Hawaii	3,904	0	0	1	0	3,905	
Idaho						0	
Illinois	4	0	21	0		25	
Indiana						0	
Iowa						0	
Kansas	7,575	0	6,170	1,681	0	15,426	
Kentucky						0	
La Jolla Band of Indians	7.8	0.0	0.0	0.0		7.8	
Louisiana	3,860	313	327	1,108		5,607	
Maine						0	
Manzanita Band	6.8	0.0	0.0	0.3		7.1	
Maryland						0	
Massachusetts	782	40	169	121	0	1,111	
Michigan	20,575			0		20,575	
Minnesota						0	
Mississippi	102	155	10,932	382	0	11,571	
Missouri						0	
Montana						0	
N Mariana Islands						0	
Nebraska						0	
Nevada	1,594		42	0		1,636	
New Hampshire	10,881		0	0	0	10,881	
New Jersey						0	
New Mexico	3,613		42	6	0	3,661	

Appendix A-3d. Secondary Contact Recreational Use in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
New York	51,979	196	116	46		52,337	
North Carolina						0	
North Dakota						0	
Ohio						0	
Ohio River Valley						0	
Oklahoma	0	23	2	0		25	
Oregon	2,777	48	0	2,237		5,062	
Pennsylvania						0	
Puerto Rico	2,105	2,456	156	664	4	5,385	The 3.6 miles listed as not attainable are underground river segments where swimming cannot be attained.
Rhode Island						0	
South Carolina						0	
South Dakota	1,886		439	197	0	2,522	
Tennessee						0	
Texas						0	
Torres-Martinez Desert Band	0	0	0	52		52	
Twenty-Nine Palms Band	0	0	0	1		1	
Utah	508		0	10	0	518	
Vermont	1,061	65	7	24		1,157	
Virginia						0	
Washington	46,643		11,945	10,729		69,317	
West Virginia	4	0	0	0	0	4	
Wisconsin						0	
Wyoming	18,997	0	0	0	0	18,997	
Yavapai-Prescott Reservation						0	Category not applicable.
Total	199,722	4,700	37,761	19,580	4	261,767	
	76%	2%	14%	7%	0%		

Appendix A-3e. Drinking Water Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Agua Caliente Band	5	5	0	0		11	
Alabama						0	
Alaska						0	
Arizona	676	55	45	3		779	
Arkansas	8,186		38	78		8,302	Arkansas reports on "waters of concern." These were entered as "partial support."
Augustine Band						0	
California	2,663	1,078	4,973	365		9,079	
Colorado			614			614	Not all surveyed waters in Colorado are designated for drinking water use.
Connecticut						0	Connecticut assesses public drinking water supplies separately.
Cortina Rancheria	0.0	0.0	0.0	2.0	0.0	2.0	
Coyote Valley Reservation						0	Use not applicable.
Delaware	202		0	6		208	
Delaware River	202	4	0	0		206	
District of Columbia						0	
Florida	123	0	95	0		219	
Georgia	3,375		0	0		3,375	
Guam						0	
Hawaii	3,889	0	0	1	0	3,889	
Idaho						0	
Illinois	573	61	206	92		932	
Indiana						0	
Iowa	106	51	0	30		186	
Kansas	4,038	0	244	2,543		6,825	
Kentucky	1,425	18	0	0		1,443	Excludes the Ohio River mainstem.
La Jolla Band of Indians						0	
Louisiana	921	0	246	0		1,167	
Maine	31,751	0	0	1		31,752	
Manzanita Band						0	
Maryland						0	
Massachusetts						0	
Michigan	20,575			0		20,575	
Minnesota						0	
Mississippi	11	13	0	0	0	24	
Missouri	2,985		0	198		3,183	
Montana						0	
N Mariana Islands						0	
Nebraska	491	0	0	0		491	
Nevada	960		529	54		1,542	
New Hampshire	245		0	0	0	245	Mileage reflects rivers/streams currently used as public water supplies.
New Jersey						0	

Appendix A-3e. Drinking Water Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
New Mexico	1,370		5	26	0	1,401	
New York	3,964	602	39	0		4,605	
North Carolina						0	
North Dakota	154	498	29	0		682	
Ohio						0	
Ohio River Valley	527	0	454	0		981	
Oklahoma	384	94	34	110		622	
Oregon	678	0	0	0		678	
Pennsylvania						0	
Puerto Rico	1,183	3,209	278	715	0	5,385	Entered "raw source of drinking water supply" use support status.
Rhode Island	0	2	0	0		2	
South Carolina	8,397		0	0		8,397	
South Dakota	546		0	0	0	546	
Tennessee	3,910			30		3,940	
Texas	8,881	0	0	0	0	8,881	
Torres-Martinez Desert Band						0	
Twenty-Nine Palms Band						0	
Utah	3,560		0	0	0	3,560	
Vermont	903	92	4	7		1,006	
Virginia	2,870	5	5	0		2,880	
Washington						0	
West Virginia	1,589	57	326	356	14	2,340	
Wisconsin						0	
Wyoming						0	
Yavapai-Prescott Reservation	0.0	0.0	0.0	2.1		2.1	
Total	122,318	5,844	8,164	4,618	14	140,956	
	87%	4%	6%	3%	0%		

Appendix A-3f. Agriculture Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Agua Caliente Band	12	37	0	0		50	
Alabama						0	
Alaska						0	
Arizona	3,166	115	273	98		3,652	Entered "agricultural uses overall" use support status.
Arkansas	8,513		0	0		8,513	Entered "agricultural and industrial" use support status. Arkansas reports on "waters of concern." These were entered as "partial support."
Augustine Band						0	
California	2,316	1,049	4,532	524		8,421	
Colorado	29,347		16	0	0	29,363	
Connecticut						0	
Cortina Rancheria	0.0	0.0	2.0	0.0	0.0	2.0	
Coyote Valley Reservation	0.00	0.00	0.52	0.00	0.00	0.52	
Delaware	1,962		0	0		1,962	
Delaware River	206	0	0	0		206	
District of Columbia						0	
Florida						0	
Georgia						0	
Guam						0	
Hawaii						0	
Idaho						0	
Illinois						0	
Indiana						0	
Iowa						0	
Kansas	5,996	0	192	362		6,550	
Kentucky						0	
La Jolla Band of Indians	0.0	7.8	0.0	0.0		7.8	
Louisiana	307	0	0	0		307	
Maine	31,752	0	0	0		31,752	
Manzanita Band						0	
Maryland						0	
Massachusetts						0	
Michigan	20,575			0		20,575	
Minnesota						0	
Mississippi						0	
Missouri						0	
Montana						0	
N Mariana Islands						0	
Nebraska	1,454	0	0	0		1,454	
Nevada	1,590		46	0		1,636	Entered "irrigation" use support status.
New Hampshire	2,579		1	0	0	2,580	New Hampshire assessed 2579.5 miles for this use.
New Jersey						0	

Appendix A-3f. Agriculture Use Support in Assessed Rivers and Streams

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
New Mexico	4,849		31	60	0	4,940	Entered "livestock watering" use support status. Of the "fully supporting" miles, 26.9 miles were reported as "fully supporting, impacts observed."
New York						0	
North Carolina						0	
North Dakota						0	
Ohio						0	
Ohio River Valley						0	
Oklahoma	360	71	95	5		531	
Oregon	53,735	0	0	0		53,735	
Pennsylvania						0	
Puerto Rico						0	Category not applicable.
Rhode Island						0	
South Carolina						0	
South Dakota	2,635		339	58	0	3,032	
Tennessee	53,507			0		53,507	Entered "irrigation" use support status.
Texas						0	
Torres-Martinez Desert Band	1.9	0.0	0.0	0.0		1.9	
Twenty-Nine Palms Band						0	
Utah	6,735		556	1,148	0	8,438	
Vermont	903	94	4	12		1,013	
Virginia						0	
Washington						0	
West Virginia						0	
Wisconsin						0	
Wyoming	94,460	0	0	0	0	94,460	
Yavapai-Prescott Reservatior	1.8	0.1	0.0	0.0		1.9	Entered "livestock" use support status.
Total	326,964	1,373	6,086	2,267	0	336,690	
	97%	0%	2%	1%	0%		

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	1 - Siltation				2 - Pathogens				3 - Nutrients			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	271	90	0	361	231	176	0	407	0	44	0	44
Alaska				0			63	63				0
Arizona				0	239	18	0	257	105	8	0	113
Arkansas	2,110	114	0	2,223	210	284	0	494	280	162	0	442
Augustine Band				0			2.1	2.1			2.1	2.1
California	160	4,406	0	4,566	231	2,559	0	2,790	212	3,302	0	3,515
Colorado			240	240			122	122				0
Connecticut	23	19	0	42	125	17	0	142	0	95	0	95
Cortina Rancheria				0				0				0
Coyote Valley Reservation	0.52	0	0	0.52	0.12	0	0	0.12				0
Delaware				0	367	19	0	386	10	52	0	62
Delaware River				0				0				0
District of Columbia	0	0	0	0	23	4	0	27				0
Florida				0	0	616	0	616	0	1,159	0	1,159
Georgia				0	1,265	1,456	0	2,721				0
Guam				0				0				0
Hawaii	0	601	0	601	0	1,639	0	1,639	90	1,415	0	1,504
Idaho			573	573			127	127			214	214
Illinois	378	9,939	0	10,317	128	168	0	296	580	10,136	0	10,716
Indiana				0	0	877	0	877				0
Iowa	0	289	0	289	137	364	0	502	0	46	0	46
Kansas	0	172	0	172	1,681	6,169	0	7,850	0	104	0	104
Kentucky	784	352	0	1,136	1,589	449	0	2,038	250	327	0	577
La Jolla Band of Indians				0				0				0
Louisiana	0	324	0	324	1,385	1,399	0	2,784	0	1,149	0	1,149
Maine				0	168	54	0	222				0
Manzanita Band				0			7.2	7.2				0
Maryland				0	5	0	0	5	0	243	0	243
Massachusetts	0	0	40	40	0	0	566	566	0	0	154	154
Michigan	353	147	0	500	298	120	0	418	129	165	0	294
Minnesota	0	3,782	0	3,782	0	5,165	0	5,165	0	3,604	0	3,604
Mississippi	0	34,389	0	34,389	588	10,711	0	11,300	116	34,874	0	34,990
Missouri	0	7,601	0	7,601	48	0	0	48	4	0	0	4
Montana			6,997	6,997			1,605	1,605			6,095	6,095
N Mariana Islands				0				0				0

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	4 - Organic Enrichment/Low DO				5 - Metals				6 - Pesticides			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	208	283	0	492	38	24	0	62	36	12	0	48
Alaska			8	8			16	16			7	7
Arizona	127	8	0	135	495	44	0	539	99	10	0	109
Arkansas	38	0	0	38	367	13	0	380				0
Augustine Band				0				0			2.1	2.1
California	50	859	0	909	584	3,125	0	3,709	313	2,281	0	2,594
Colorado			12	12			963	963				0
Connecticut	16	62	0	78	90	13	0	103				0
Cortina Rancheria				0			2	2				0
Coyote Valley Reservation				0				0				0
Delaware	28	15	0	43	19	17	0	36	11	0	0	11
Delaware River				0	50	0	0	50	0	8	0	8
District of Columbia	1	19	0	20				0				0
Florida	0	1,711	0	1,711	0	18	0	18				0
Georgia	158	336	0	494	305	1,444	0	1,749	89	0	0	89
Guam				0				0				0
Hawaii	1	0	0	1	0	5	0	5	0	147	0	147
Idaho			101	101			3	3			12	12
Illinois	147	2,291	0	2,438	163	1,042	0	1,205	0	46	0	46
Indiana	0	169	0	169	141	2,257	0	2,398	0	70	0	70
Iowa	0	171	0	171				0				0
Kansas	497	2,425	0	2,922	345	141	0	486				0
Kentucky	242	232	0	475	91	73	0	164	23	0	0	23
La Jolla Band of Indians				0				0				0
Louisiana	1,109	2,068	0	3,177	170	4,143	0	4,313	14	599	0	613
Maine	208	5	0	213	2	0	0	2				0
Manzanita Band				0				0				0
Maryland	243	0	0	243				0				0
Massachusetts	0	0	182	182	0	0	378	378	0	0	4	4
Michigan	216	80	0	296	314	44	0	358	11	1	0	12
Minnesota	0	2,775	0	2,775	0	249	0	249				0
Mississippi	57	30,943	0	31,000	14	859	0	873	0	32,572	0	32,572
Missouri	0	0	404	404	329	0	0	329	24	0	0	24
Montana				0			4,377	4,377				0
N Mariana Islands				0				0				0

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

	7 - Other Habitat Alterations				8 - Thermal Modifications				9 - pH			
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Agua Caliente Band				0				0				0
Alabama	65	0	0	65	0	15	0	15	61	83	0	144
Alaska				0				0				0
Arizona				0				0	205	22	0	227
Arkansas				0				0				0
Augustine Band				0				0				0
California	114	1,694	0	1,808	0	1,130	0	1,130	25	180	0	205
Colorado				0				0			50	50
Connecticut	8	70	0	78				0				0
Cortina Rancheria				0				0				0
Coyote Valley Reservation	0	0.52	0	0.52	0.4	0	0	0.4	0	0.4	0	0.4
Delaware				0				0				0
Delaware River				0				0				0
District of Columbia	0	1	0	1				0	0	7	0	7
Florida				0				0				0
Georgia				0	0	23	0	23	1	18	0	19
Guam				0				0				0
Hawaii	3	267	0	270				0				0
Idaho			113	113			145	145			22	22
Illinois	453	1,928	0	2,381	0	13	0	13	49	273	0	322
Indiana	0	109	0	109				0				0
Iowa	0	1,446	0	1,446				0	0	20	0	20
Kansas				0	0	2	0	2	281	979	0	1,260
Kentucky	176	162	0	338	0	7	0	7	224	63	0	286
La Jolla Band of Indians				0				0				0
Louisiana	30	171	0	201				0	0	183	0	183
Maine				0				0	1	0	0	1
Manzanita Band				0				0				0
Maryland				0				0	116	0	0	116
Massachusetts	0	0	45	45	0	0	22	22	0	0	43	43
Michigan	62	77	0	139	0	27	0	27				0
Minnesota	0	2,563	0	2,563				0				0
Mississippi	0	211	0	211	0	7	0	7	0	962	0	962
Missouri	0	4,724	0	4,724				0				0
Montana			6,344	6,344			2,550	2,550				0
N Mariana Islands				0				0				0

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	10 - Suspended Solids				11 - Flow Alteration				12 - Salinity/TDS/Chorides			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama				0	0	8	0	8				0
Alaska				0				0				0
Arizona				0				0				0
Arkansas				0				0	54	174	0	228
Augustine Band				0				0				0
California	11	1,112	0	1,123	717	474	0	1,191	285	1,113	0	1,399
Colorado				0				0				0
Connecticut	0	22	0	22	1	0	0	1				0
Cortina Rancheria			2	2				0			2	2
Coyote Valley Reservation				0	0.52	0	0	0.52				0
Delaware				0				0				0
Delaware River				0				0				0
District of Columbia	0	4	0	4	0	2	0	2				0
Florida	0	354	0	354				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii	0	24	0	24	88	149	0	237				0
Idaho				0				0				0
Illinois	85	3,844	0	3,929	113	1,108	0	1,221	96	852	0	948
Indiana				0				0	0	3	0	3
Iowa				0	0	199	0	199				0
Kansas				0				0	1,364	99	0	1,463
Kentucky	54	136	0	190	26	0	0	26	78	0	0	78
La Jolla Band of Indians				0				0				0
Louisiana	30	367	0	397	14	294	0	308	0	197	0	197
Maine	7	0	0	7				0				0
Manzanita Band				0				0				0
Maryland				0	2	0	0	2				0
Massachusetts	0	0	87	87	0	0	99	99	0	0	14	14
Michigan	17	10	0	27	104	94	0	198	5	1	0	6
Minnesota	0	1,598	0	1,598				0	0	11	0	11
Mississippi	88	378	0	466	32	4	0	35	21	291	0	313
Missouri	0	0	18	18				0				0
Montana			6,386	6,386			7,125	7,125			4,786	4,786
N Mariana Islands				0				0				0

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	13 - Turbidity				14 - Other Inorganics				15 - PCBs			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	55	0	0	55				0				0
Alaska			287	287				0			5	5
Arizona				0	102	9	0	111				0
Arkansas				0				0				0
Augustine Band				0				0				0
California	77	336	0	413	0	132	0	132	12	58	0	70
Colorado				0			173	173				0
Connecticut				0				0	50	95	0	145
Cortina Rancheria				0				0				0
Coyote Valley Reservation				0				0				0
Delaware				0				0				0
Delaware River				0				0	0	5	0	5
District of Columbia				0				0				0
Florida	0	444	0	444				0				0
Georgia				0	0	6	0	6				0
Guam				0				0				0
Hawaii	181	1,353	0	1,534				0				0
Idaho				0				0				0
Illinois				0	15	635	0	650				0
Indiana				0	0	70	0	70	953	1,962	0	2,915
Iowa				0				0				0
Kansas				0	2,283	186	0	2,469				0
Kentucky	0	1	0	1				0	245	1,059	0	1,304
La Jolla Band of Indians				0				0				0
Louisiana	123	529	0	652				0				0
Maine				0				0				0
Manzanita Band				0				0				0
Maryland				0				0				0
Massachusetts	0	0	83	83	0	0	1	1				0
Michigan				0	2	1	0	3				0
Minnesota	0	4,196	0	4,196				0				0
Mississippi	79	206	0	285				0				0
Missouri				0				0				0
Montana				0			3,208	3,208				0
N Mariana Islands				0				0				0

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	16 - Priority Organic Chemicals				17 - Mercury				18 - Unionized Ammonia			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	53	0	0	53	32	0	0	32	63	34	0	97
Alaska				0				0				0
Arizona				0	30	1	0	31				0
Arkansas	66	0	0	66	367	0	0	367	12	0	0	12
Augustine Band				0				0				0
California	70	198	0	268	202	255	0	457	31	527	0	558
Colorado				0				0			53	53
Connecticut	66	1	0	67				0	40	17	0	57
Cortina Rancheria				0				0				0
Coyote Valley Reservation				0				0				0
Delaware	24	1	0	24				0	13	0	0	13
Delaware River				0	50	0	0	50				0
District of Columbia				0				0				0
Florida				0	0	0	0	0				0
Georgia	1	8	0	9				0	0	0	0	0
Guam				0				0				0
Hawaii				0				0				0
Idaho			7	7			3	3				0
Illinois	169	505	0	674				0	35	387	0	422
Indiana	0	115	0	115				0	0	105	0	105
Iowa	14	0	0	14				0	0	129	0	129
Kansas				0				0	0	16	0	16
Kentucky	95	1,095	0	1,190	0	7	0	7	14	4	0	17
La Jolla Band of Indians				0				0				0
Louisiana	20	85	0	105	170	2,883	0	3,053	0	347	0	347
Maine				0				0				0
Manzanita Band				0				0				0
Maryland				0				0				0
Massachusetts	0	0	317	317				0	0	0	29	29
Michigan	628	58	0	686				0	9	15	0	24
Minnesota				0	0	157	0	157	0	292	0	292
Mississippi	23	69	0	92				0	0	1	0	1
Missouri				0				0				0
Montana				0				0				0
N Mariana Islands				0				0				0

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	19 - Phosphorus				20 - Nitrogen				Comment
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	
Agua Caliente Band				0				0	The Agua Caliente Band has no impaired waters; however, rivers are threatened by unknown toxicity, metals, salinity, and radiation.
Alabama				0				0	Also reported 42 miles impaired by chlordane (major)
Alaska				0				0	
Arizona	54	4	0	58	52	4	0	56	
Arkansas				0				0	
Augustine Band				0				0	
California				0				0	
Colorado				0				0	
Connecticut				0				0	Connecticut notes that all 948 assessed river miles are impaired by mercury due to a statewide fish consumption advisory.
Cortina Rancheria				0				0	
Coyote Valley Reservation				0				0	Sacramento squawfish, an imported preditor, combined with thermal pollution due to agricultural drawdown, is affecting the threatened steelhead population.
Delaware				0				0	
Delaware River				0				0	
District of Columbia				0				0	
Florida	0	541	0	541	0	933	0	933	
Georgia				0				0	
Guam				0				0	
Hawaii				0				0	
Idaho				0			26	26	Information from Idaho's 1998 Section 303(d) list.
Illinois				0				0	
Indiana				0				0	
Iowa				0	30	0	0	30	
Kansas				0				0	
Kentucky				0				0	
La Jolla Band of Indians				0				0	The La Jolla Band has no impaired waters; however, rivers are threatened by metals, ammonia, salinity/TDS/chlorides, flow alterations, and pathogens.
Louisiana	0	1,149	0	1,149	0	994	0	994	
Maine				0				0	
Manzanita Band				0				0	
Maryland				0				0	
Massachusetts				0				0	
Michigan				0				0	
Minnesota	0	1,403	0	1,403	0	1,843	0	1,843	Minnesota included some causes that threaten waters rather than impair them. This is because standards are not in place for those parameters.
Mississippi				0				0	
Missouri				0				0	
Montana				0				0	
N Mariana Islands				0				0	

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

	1 - Siltation				2 - Pathogens				3 - Nutrients			
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Nebraska	85	0	0	85	910	561	0	1,471				0
Nevada				0				0	0	275	0	275
New Hampshire	0	56	0	56	39	44	0	83	0	6	0	6
New Jersey	0	0	78	78	0	0	133	133	0	0	269	269
New Mexico	0	48	0	48	26	507	0	533	223	356	0	580
New York			1,120	1,120			82	82			778	778
North Carolina			2,261	2,261			280	280				0
North Dakota	138	2,929	0	3,067	59	2,718	0	2,777	11	3,012	0	3,023
Ohio	547	43	0	590	63	73	0	137	306	400	0	705
Ohio River Valley				0	981	0	0	981				0
Oklahoma	899	3,517	0	4,415	162	475	0	637	165	3,785	0	3,950
Oregon	0	1,354	0	1,354	0	2,429	0	2,429	0	240	0	240
Pennsylvania	0	0	1,232	1,232	0	0	31	31	0	0	875	875
Puerto Rico	0	0	0	0	1,096	3	0	1,099	0	1	0	1
Rhode Island				0	44	49	0	93	16	36	0	52
South Carolina				0	5,018	4,171	0	9,188				0
South Dakota				0	545	362	0	907				0
Tennessee	2,388	9,578	0	11,966	1,109	2,742	0	3,851	677	2,631	0	3,308
Texas				0	2,640	961	0	3,600	25	0	0	25
Torres-Martinez Desert Band				0			1	1			50	50
Twenty-Nine Palms Band				0			1	1				0
Utah	22	706	0	729	10	0	0	10	31	954	0	984
Vermont	69	38	0	107	34	24	0	58	24	22	0	46
Virginia	43	198	0	241	543	857	0	1,400				0
Washington				0	0	0	28,067	28,067				0
West Virginia	881	1,685	0	2,566	643	342	0	986	303	658	0	960
Wisconsin	974	6,187	0	7,160	109	1,195	0	1,304	337	2,477	0	2,814
Wyoming				0				0				0
Yavapai-Prescott Reservation				0	0	2.1	0	2.1	0.3	1.7	0	2
Total	**10,124**	**88,563**	**12,541**	**111,228**	**22,751**	**49,778**	**31,088**	**103,616**	**3,893**	**71,740**	**8,437**	**84,071**

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

	4 - Organic Enrichment/Low DO				5 - Metals				6 - Pesticides			
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Nebraska	25	23	0	48				0	1,492	107	0	1,599
Nevada				0				0				0
New Hampshire	5	20	0	24	0	302	0	302	0	0	0	0
New Jersey				0				0	0	0	16	16
New Mexico	12	27	0	39	220	507	0	727	0	3	0	3
New York			99	99			24	24			1	1
North Carolina			307	307			126	126				0
North Dakota	7	752	0	759	0	516	0	516	0	6	0	6
Ohio	763	294	0	1,056	379	360	0	739	16	163	0	179
Ohio River Valley				0	535	0	0	535	949	0	0	949
Oklahoma	109	1,701	0	1,810	74	1,219	0	1,294	268	3,744	0	4,012
Oregon	0	1,044	0	1,044	0	718	0	718	0	285	0	285
Pennsylvania	0	0	475	475	0	0	1,610	1,610	0	0	277	277
Puerto Rico	38	7	0	45	371	163	0	534	0	0	0	0
Rhode Island	16	14	0	30	38	101	0	139				0
South Carolina	831	614	0	1,446	814	4,271	0	5,086	108	0	0	108
South Dakota	0	103	0	103	25		0	25				0
Tennessee	1,009	2,987	0	3,996	475	861	0	1,336	283	233	0	516
Texas	351	308	0	659	308	396	0	704	41	4	0	45
Torres-Martinez Desert Band				0				0			50	50
Twenty-Nine Palms Band				0				0				0
Utah	31	15	0	46	251	37	0	289				0
Vermont	5	44	0	49	9	3	0	12				0
Virginia	265	374	0	639	86	142	0	228				0
Washington	0	0	3,669	3,669	0	0	19,823	19,823				0
West Virginia	311	641	0	952	936	1,193	0	2,129				0
Wisconsin	384	1,478	0	1,862	29	378	0	407	87	269	0	356
Wyoming				0				0				0
Yavapai-Prescott Reservation				0	2.1	0	0	2.1				0
Total	**7,506**	**54,899**	**5,257**	**67,662**	**8,069**	**24,678**	**27,323**	**60,070**	**3,863**	**40,559**	**369**	**44,791**

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	7 - Other Habitat Alterations				8 - Thermal Modifications				9 - pH			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Nebraska	8	0	0	8	0	16	0	16				0
Nevada				0	0	194	0	194	0	133	0	133
New Hampshire	1	5	0	6	0	0	0	0	1	0	0	1
New Jersey	0	0	57	57	0	0	3	3	0	0	2	2
New Mexico				0	238	397	0	635	149	90	0	239
New York				0			173	173			18	18
North Carolina				0			0	0			206	206
North Dakota	635	2,563	0	3,197				0				0
Ohio	922	354	0	1,276	17	0	0	17	142	6	0	148
Ohio River Valley	61	0	0	61				0				0
Oklahoma	336	749	0	1,085				0	11	760	0	771
Oregon	0	2,103	0	2,103	0	12,102	0	12,102	0	1,083	0	1,083
Pennsylvania	0	0	197	197	0	0	31	31	0	0	381	381
Puerto Rico	0	0	0	0	0	0	0	0	12	0	0	12
Rhode Island	0	0	0	0				0	0	4	0	4
South Carolina				0				0	65	61	0	126
South Dakota	0	43	0	43	11	30	0	41	39	24	0	63
Tennessee	782	2,763	0	3,545	22	149	0	171	393	579	0	972
Texas				0				0				0
Torres-Martinez Desert Band				0				0				0
Twenty-Nine Palms Band				0				0				0
Utah	0	736	0	736	119	80	0	199	0	0	0	0
Vermont	20	8	0	29	20	34	0	54	0	14	0	14
Virginia	0	77	0	77	0	92	0	92	223	194	0	416
Washington				0	0	0	17,910	17,910	0	0	16,522	16,522
West Virginia	38	284	0	322	2	48	0	50	686	436	0	1,122
Wisconsin	1,147	8,757	0	9,904	185	1,486	0	1,671	5	0	0	5
Wyoming				0				0				0
Yavapai-Prescott Reservation				0				0				0
Total	**4,862**	**31,865**	**6,756**	**43,483**	**613**	**15,852**	**20,833**	**37,298**	**2,688**	**6,174**	**17,244**	**26,105**

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	10 - Suspended Solids				11 - Flow Alteration				12 - Salinity/TDS/Chorides			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Nebraska				0	0	51	0	51				0
Nevada	0	297	0	297				0				0
New Hampshire	0	0	0	0	0	5	0	5	0	0	0	0
New Jersey				0	0	0	20	20				0
New Mexico				0				0	72	0	0	72
New York				0			47	47			8	8
North Carolina				0				0				0
North Dakota				0	12	586	0	598	0	118	0	118
Ohio	50	67	0	116	313	230	0	543	24	49	0	74
Ohio River Valley				0				0				0
Oklahoma	898	2,846	0	3,743	27	150	0	177	402	1,283	0	1,685
Oregon				0	0	1,624	0	1,624				0
Pennsylvania	0	0	455	455	0	0	77	77	0	0	59	59
Puerto Rico	0	0	0	0	0	0	0	0	0	0	0	0
Rhode Island	0	5	0	5	0	15	0	15	0	14	0	14
South Carolina				0				0				0
South Dakota	1,257	496	0	1,753	0	72	0	72	58	2	0	60
Tennessee	536	774	0	1,310	413	1,058	0	1,471	52	0	0	52
Texas				0				0	25	0	0	25
Torres-Martinez Desert Band				0				0			1.9	1.9
Twenty-Nine Palms Band				0				0				0
Utah				0	0	107	0	107	1,084	467	0	1,551
Vermont	0	21	0	21	38	10	0	48				0
Virginia	2	0	0	2				0				0
Washington				0				0				0
West Virginia	0	12	0	12	41	245	0	286	0	16	0	16
Wisconsin	13	40	0	53	263	2,296	0	2,559	13	28		41
Wyoming				0				0				0
Yavapai-Prescott Reservation				0				0				0
Total	**3,047**	**12,407**	**6,948**	**22,401**	**2,203**	**8,781**	**7,368**	**18,352**	**3,634**	**4,719**	**4,871**	**13,224**

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	13 - Turbidity				14 - Other Inorganics				15 - PCBs			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Nebraska				0				0	665	57	0	722
Nevada	15	391	0	406				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	265	0	265
New Jersey				0				0				0
New Mexico	409	368	0	777	3	0	0	3				0
New York				0				0				0
North Carolina			160	160				0				0
North Dakota				0				0				0
Ohio	4	11	0	15	7	35	0	43				0
Ohio River Valley				0				0	981	0	0	981
Oklahoma	0	101	0	101	11	105	0	116				0
Oregon	0	66	0	66				0	0	135	0	135
Pennsylvania	0	0	143	143	0	0	201	201				0
Puerto Rico	0	1	0	1	334	90	0	425				0
Rhode Island	0	16	0	16				0	8	0	0	8
South Carolina				0				0				0
South Dakota				0				0				0
Tennessee				0	10	66	0	76	330	249	0	579
Texas				0				0				0
Torres-Martinez Desert Band				0				0				0
Twenty-Nine Palms Band				0				0				0
Utah				0	0	0	0	0				0
Vermont	0	9	0	9				0				0
Virginia				0				0	0	98	0	98
Washington				0				0				0
West Virginia	417	186	0	602	52	171	0	223	19	0	0	19
Wisconsin	293	1,837	0	2,130				0				0
Wyoming				0				0				0
Yavapai-Prescott Reservation				0				0				0
Total	**1,652**	**10,051**	**674**	**12,376**	**2,820**	**1,507**	**3,583**	**7,910**	**3,264**	**3,983**	**5**	**7,251**

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	16 - Priority Organic Chemicals				17 - Mercury				18 - Unionized Ammonia			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Nebraska				0	86	0	0	86	32	118	0	150
Nevada				0				0				0
New Hampshire	1	0	0	1				0	0	0	0	0
New Jersey				0				0				0
New Mexico				0				0	0	12	0	12
New York			420	420				0			1	1
North Carolina				0				0			45	45
North Dakota				0	0	147	0	147	0	34	0	34
Ohio	126	157	0	283				0	116	41	0	157
Ohio River Valley	47	0	0	47	451	0	0	451				0
Oklahoma	16	153	0	169				0	14	114	0	128
Oregon				0				0	0	145	0	145
Pennsylvania	0	0	285	285				0	0	0	29	29
Puerto Rico	0	0	0	0				0	3	13	0	16
Rhode Island				0				0	16	13	0	29
South Carolina	0	34	0	34				0				0
South Dakota				0				0	0	27	0	27
Tennessee	269	16	0	285				0	92	52	0	144
Texas	141	4	0	145	53	0	0	53				0
Torres-Martinez Desert Band				0				0				0
Twenty-Nine Palms Band				0				0				0
Utah				0				0	0	0	0	0
Vermont				0				0				0
Virginia	0	0	0	0				0				0
Washington				0				0	0	0	912	912
West Virginia	94	5	0	99				0	10	2	0	12
Wisconsin	158	203	0	361				0	27	233	0	259
Wyoming				0				0				0
Yavapai-Prescott Reservation				0				0				0
Total	**2,080**	**2,706**	**1,028**	**5,814**	**1,441**	**3,449**	**3**	**4,893**	**525**	**2,676**	**1,069**	**4,270**

Appendix A-4. Leading Pollutants and Stressors Impairing Assessed Rivers and Streams

Jurisdiction	19 - Phosphorus				20 - Nitrogen				Comment
	Major	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	
Nebraska				0				0	
Nevada	0	252	0	252				0	
New Hampshire	0	0	0	0	0	0	0	0	Excludes the effect of a statewide fish consumption advisory for mercury.
New Jersey	0	0	16	16				0	Data based on a cause assessment in 4 watershed management areas. New Jersey notes that their cause and source assessment is preliminary and these numbers will be updated in the near future.
New Mexico	223	356	0	580				0	
New York				0				0	
North Carolina				0				0	
North Dakota				0				0	
Ohio				0				0	
Ohio River Valley				0				0	
Oklahoma				0				0	
Oregon				0				0	
Pennsylvania				0				0	
Puerto Rico				0				0	
Rhode Island				0				0	
South Carolina				0				0	
South Dakota				0				0	Thermal modifications refer to elevated stream temperature.
Tennessee				0				0	
Texas				0				0	
Torres-Martinez Desert Band				0				0	
Twenty-Nine Palms Band				0				0	
Utah				0				0	
Vermont				0				0	
Virginia				0				0	
Washington				0				0	
West Virginia	12	0	0	12	15	0	0	15	
Wisconsin				0				0	
Wyoming				0				0	
Yavapai-Prescott Reservation				0				0	
Total	**290**	**3,704**	**16**	**4,010**	**97**	**3,774**	**26**	**3,897**	

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	1 - Agriculture				2 - Hydromodification				3 - Nonirrigated Crop Production			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	307	297	0	604	28	25	0	53				0
Alaska				0			13	13				0
Arizona	787	58	0	845	51	4	0	55				0
Arkansas	2,148	122	0	2,270	28	0	0	28				0
Augustine Band			2.1	2.1				0				0
California	466	3,493	0	3,959	518	557	0	1,075				0
Colorado			418	418			26	26				0
Connecticut	0	83	0	83	7	16	0	23				0
Cortina Rancheria	0	0	0	0				0				0
Coyote Valley Reservation	0.52	0	0	0.52	0.52	0	0	0.52				0
Delaware	70	299	0	369				0				0
Delaware River				0				0				0
District of Columbia				0	0	9	0	9				0
Florida	0	1,939	0	1,939	0	1,119	0	1,119				0
Georgia	0	0	0	0	51	14	0	65	0	0	0	0
Guam				0				0				0
Hawaii	21	717	0	738	0	10	0	10				0
Idaho				0				0				0
Illinois	786	10,191	0	10,977	451	5,224	0	5,675	472	6,579	0	7,051
Indiana				0				0				0
Iowa	30	783	0	813	0	1,206	0	1,206				0
Kansas	4,017	5,808	0	9,825	1,309	518	0	1,827	0	283	0	283
Kentucky	694	300	0	994	80	81	0	161				0
La Jolla Band of Indians				0				0				0
Louisiana	211	1,451	0	1,662	36	396	0	432	85	561	0	646
Maine	132	20	0	152	97	16	0	113				0
Manzanita Band			7.2	7.2				0				0
Maryland	0	0	0	0	2	0	0	2				0
Massachusetts	0	0	59	59	0	0	81	81				0
Michigan	266	201	0	467	56	65	0	121	143	136	0	279
Minnesota	0	7,285	0	7,285	0	3,889	0	3,889				0

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	4 - Natural Sources				5 - Urban Runoff/Storm Sewers				6 - Irrigated Crop Production			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	14	0	0	14	168	137	0	305				0
Alaska				0			110	110				0
Arizona	1,161	88	0	1,249	108	12	0	120	159	12	0	171
Arkansas				0				0				0
Augustine Band				0			2.1	2.1				0
California	51	1,858	0	1,909	95	1,727	0	1,822	81	1,612	0	1,693
Colorado				0			58	58				0
Connecticut				0	3	106	0	109				0
Cortina Rancheria			2	2	0	0	-	0				0
Coyote Valley Reservation				0	0.52	0	0	0.52	0.52	0	0	0.52
Delaware	16	112	0	128	0	125	0	125				0
Delaware River				0	0	50	0	50				0
District of Columbia	0	1	0	1	9	29	0	38				0
Florida				0	0	1,074	0	1,074				0
Georgia	433	0	0	433	1,143	633	0	1,776	0	0	0	0
Guam				0				0				0
Hawaii	67	1,780	0	1,847	0	9	0	9				0
Idaho				0				0				0
Illinois	26	187	0	213	70	1,795	0	1,865	0	8	0	8
Indiana				0				0				0
Iowa				0	4	18	0	22				0
Kansas	3,445	951	0	4,396	258	355	0	613	2,098	51	0	2,149
Kentucky	2	0	0	2	289	825	0	1,115				0
La Jolla Band of Indians				0				0				0
Louisiana	21	1,356	0	1,377	0	1,122	0	1,122	25	831	0	856
Maine	2	0	0	2	58	10	0	69				0
Manzanita Band				0				0				0
Maryland				0				0				0
Massachusetts				0	0	0	478	478				0
Michigan	3	13	0	16	93	14	0	107				0
Minnesota				0	0	2,887	0	2,887				0

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	7 - Municipal Point Souces				8 - Animal Feeding Operations				9 - Resource Extraction			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	127	8	0	135				0	30	20	0	50
Alaska				0				0			309	309
Arizona	70	7	0	77				0	348	30	0	378
Arkansas	176	73	0	249				0	24	143	0	167
Augustine Band				0				0				0
California	24	1,145	0	1,169	0	88	0	88	661	805	0	1,466
Colorado			238	238				0			625	625
Connecticut	96	74	0	170				0	0	36	0	36
Cortina Rancheria	0	0	0	0				0				0
Coyote Valley Reservation				0				0	0.52	0	0	0.52
Delaware	13	46	0	59				0				0
Delaware River	0	50	0	50				0				0
District of Columbia	1	0	0	1				0				0
Florida	0	405	0	405				0	0	554	0	554
Georgia	130	315	0	445	0	0	0	0	0	0	0	0
Guam				0				0				0
Hawaii	0	19	0	19				0				0
Idaho				0				0				0
Illinois	352	2,322	0	2,674	26	98	0	124	114	1,783	0	1,897
Indiana				0				0	39	0	0	39
Iowa	14	94	0	108				0	0	23	0	23
Kansas	496	1,400	0	1,896	2,145	6,689	0	8,834	964	67	0	1,031
Kentucky	469	341	0	811	26	16	0	42	814	103	0	917
La Jolla Band of Indians				0				0				0
Louisiana	98	1,546	0	1,644	56	213	0	269	44	275	0	319
Maine	32	58	0	90	3	0	0	3	3	0	0	3
Manzanita Band				0				0				0
Maryland	1	0	0	1				0	116	0	0	116
Massachusetts	0	0	293	293				0	0	0	12	12
Michigan	197	68	0	265	42	4	0	46	35	15	0	50
Minnesota	0	664	0	664				0	0	590	0	590

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	10 - Silviculture				11 - Land Disposal				12 - Range Grazing - Riparian and/or Upland			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama				0	34	0	0	34				0
Alaska			12	12			109	109				0
Arizona	21	1	0	22	72	5	0	77	634	50	0	684
Arkansas				0				0				0
Augustine Band				0				0				0
California	63	1,854	0	1,917	10	207	0	217	10	1,464	0	1,474
Colorado			11	11				0				0
Connecticut				0	8	57	0	65				0
Cortina Rancheria	0	0	0	0				0				0
Coyote Valley Reservation	0	0.4	0	0.4	0.4	0	0	0.4				0
Delaware				0	1	84	0	85				0
Delaware River				0				0				0
District of Columbia				0	0	2	0	2				0
Florida	0	428	0	428	0	862	0	862				0
Georgia	0	0	0	0	0	0	0	0	0	0	0	0
Guam				0				0				0
Hawaii	0	8	0	8	0	9	0	9				0
Idaho				0				0				0
Illinois				0	14	40	0	54	0	5	0	5
Indiana				0	0	34	0	34				0
Iowa				0				0				0
Kansas				0				0				0
Kentucky	20	36	0	56	383	871	0	1,254				0
La Jolla Band of Indians				0				0				0
Louisiana	3	323	0	326	128	845	0	973				0
Maine	21	0	0	21	36	8	0	43				0
Manzanita Band				0				0				0
Maryland				0	4	0	0	4				0
Massachusetts				0	0	0	187	187				0
Michigan				0	3	2	0	5				0
Minnesota	0	329	0	329	0	3,692	0	3,692				0

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	13 - Habitat Modification (other than Hydro)				14 - Channelization				15 - Industrial Point Sources			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	55	0	0	55				0	25	27	0	52
Alaska			21	21				0				0
Arizona				0				0				0
Arkansas				0				0	134	54	0	188
Augustine Band				0				0				0
California	200	817	0	1,017	6	32	0	38	34	612	0	646
Colorado				0				0			238	238
Connecticut	0	1	0	1	8	10	0	18	65	20	0	85
Cortina Rancheria				0				0	0	0	0	0
Coyote Valley Reservation	0.1	0	0	0.1	0.4	0	0	0.4				0
Delaware				0				0	18	56	0	74
Delaware River				0				0	0	50	0	50
District of Columbia	1	17	0	18	0	9	0	9	1	1	0	1
Florida				0				0	0	355	0	355
Georgia				0				0	12	91	0	103
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	115	750	0	865	288	2,836	0	3,124	45	646	0	691
Indiana				0				0				0
Iowa	0	625	0	625				0	11	54	0	65
Kansas				0				0	171	15	0	186
Kentucky	40	75	0	115	55	15	0	70	201	76	0	277
La Jolla Band of Indians				0				0				0
Louisiana	0	182	0	182	36	276	0	312	13	1,055	0	1,067
Maine	9	1	0	9				0	216	47	0	262
Manzanita Band				0				0				0
Maryland				0				0	0	0	0	0
Massachusetts				0				0	0	0	207	207
Michigan	100	49	0	149				0	257	78	0	335
Minnesota				0				0	0	79	0	79

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	16 - Construction				17 - Onsite WW Systems (Septic Tanks)				18 - Pasture Grazing - Riparian and/or Upland			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Agua Caliente Band				0				0				0
Alabama	76	13	0	90	7	10	0	17				0
Alaska			21	21			23	23				0
Arizona				0	72	5	0	77	24	2	0	26
Arkansas	54	10	0	64				0				0
Augustine Band				0				0				0
California	188	612	0	800				0	7	332	0	339
Colorado				0				0				0
Connecticut	23	16	0	39	8	0	0	8				0
Cortina Rancheria	0	0	0	0				0				0
Coyote Valley Reservation	0	0.52	0	0.52	0.05	0	0	0.05				0
Delaware	0	5	0	5	0	76	0	76				0
Delaware River				0				0				0
District of Columbia	0	0	0	0				0				0
Florida	0	965	0	965				0				0
Georgia				0	0	0	0	0	0	0	0	0
Guam				0				0				0
Hawaii	0	23	0	23				0				0
Idaho				0				0				0
Illinois	0	356	0	356	14	30	0	44	47	1,756	0	1,803
Indiana				0				0				0
Iowa				0				0				0
Kansas				0				0				0
Kentucky	9	58	0	68	294	273	0	567	0	20	0	20
La Jolla Band of Indians				0				0				0
Louisiana	18	175	0	193	128	760	0	888	0	380	0	380
Maine	5	0	0	5				0				0
Manzanita Band				0				0				0
Maryland				0				0				0
Massachusetts	0	0	4	4				0				0
Michigan	35	24	0	59	2	0	0	2	115	81	0	196
Minnesota	0	1,081	0	1,081				0				0

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

	19 - Bank or Shoreline Modification				20 - Other				Comment
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	
Agua Caliente Band				0				0	The Agua Caliente Band has no impaired waters; however, rivers are threatened by agricultural, natural, and unknown sources.
Alabama				0				0	
Alaska			8	8			66	66	"Other" refers to military sources.
Arizona				0				0	
Arkansas				0				0	
Augustine Band				0				0	
California	139	352	0	491	0	159	0	159	
Colorado				0			291	291	Colorado did not separate point sources into industrial and municipal. The 238 miles includes both industrial and municipal point source impacts.
Connecticut				0				0	
Cortina Rancheria				0				0	
Coyote Valley Reservation	0.1	0	0	0.1				0	At least 4 gravel mining sites within 2 miles upstream from the reservation (plus the probability of additional sites) have caused severely eroded banks and streambeds.
Delaware				0				0	
Delaware River				0				0	
District of Columbia	1	7	0	8				0	
Florida				0	0	646	0	646	
Georgia				0	174	228	0	402	Municipal and industrial nonpoint sources listed under "other" category. "Unknown sources" are nonpoint only.
Guam				0				0	
Hawaii				0				0	
Idaho				0				0	
Illinois	60	342	0	402	197	728	0	925	The values Illinois reported for Intensive Animal Feeding Operations refer to feedlots.
Indiana				0				0	
Iowa				0				0	
Kansas				0				0	
Kentucky	0	6	0	6				0	
La Jolla Band of Indians				0				0	The La Jolla Band has no impaired waters; however, rivers are threatened by agricultural sources, hydromodification, and unknown sources.
Louisiana	0	131	0	131	149	2,156	0	2,305	
Maine	0	7	0	7				0	
Manzanita Band				0				0	"Recreation and tourism activities" refer to horse trails.
Maryland				0				0	
Massachusetts				0				0	
Michigan	100	36	0	136	0	0	0	0	
Minnesota				0				0	Minnesota included some sources that threaten waters rather than impair them. This is because standards are not in place for those parameters associated with the sources.

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	1 - Agriculture				2 - Hydromodification				3 - Nonirrigated Crop Production			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Mississippi	140	34,884	0	35,023	16	173	0	188	46	18,232	0	18,278
Missouri	0	0	7,377	7,377	0	0	4,038	4,038	0	0	7,377	7,377
Montana			11,230	11,230			1,941	1,941			1,809	1,809
N Mariana Islands				0				0				0
Nebraska	1,699	1,388	0	3,087				0				0
Nevada	0	690	0	690	85	104	0	189				0
New Hampshire	13	46	0	59	2	12	0	14	0	0	0	0
New Jersey	0	0	33	33	0	0	11	11				0
New Mexico	1,050	2,129	0	3,179	1,905	3,373	0	5,278				0
New York			616	616			200	200				0
North Carolina			2,496	2,496			303	303				0
North Dakota	637	3,911	0	4,548	211	1,850	0	2,061	461	2,700	0	3,161
Ohio	550	571	0	1,121	927	579	0	1,505	166	225	0	391
Ohio River Valley	374	0	0	374				0				0
Oklahoma	591	4,510	0	5,100	80	908	0	988	591	3,941	0	4,532
Oregon	0	2,577	0	2,577	0	1,624	0	1,624				0
Pennsylvania	0	0	1,328	1,328	0	0	44	44				0
Puerto Rico	98	43	0	141	14	0	0	14				0
Rhode Island	6	54	0	60	16	1	0	17				0
South Carolina	1,651	1,085	0	2,736	37	121	0	158				0
South Dakota	1,027	392	0	1,419				0				0
Tennessee	1,472	7,188	0	8,660	1,610	4,442	0	6,052	170	477	0	647
Texas	791	289	0	1,080	15	20	0	35				0
Torres-Martinez Desert Band			50.1	50.1				0				0
Twenty-Nine Palms Band			1	1			1	1				0
Utah	188	2,075	0	2,263	39	979	0	1,018				0
Vermont	54	21	0	75	3	3	0	6				0
Virginia	289	553	0	842	9	0	0	9				0
Washington	0	0	23,012	23,012	0	0	12,909	12,909				0
West Virginia	614	1,129	0	1,743	79	336	0	415	272	218	0	490
Wisconsin	676	5,682	0	6,358	169	2,593	0	2,762	146	1,395	0	1,541
Wyoming				0				0				0
Yavapai-Prescott Reservation	0.3	1.7	0	2				0				0
Total	**21,856**	**102,264**	**46,630**	**170,750**	**7,930**	**30,266**	**19,567**	**57,763**	**2,551**	**34,747**	**9,186**	**46,484**

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	4 - Natural Sources				5 - Urban Runoff/Storm Sewers				6 - Irrigated Crop Production			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Mississippi	0	196	0	196	50	801	0	851	39	15,628	0	15,666
Missouri				0	0	0	44	44				0
Montana			5,679	5,679			83	83			7,220	7,220
N Mariana Islands				0				0				0
Nebraska	0	1,355	0	1,355				0	0	12	0	12
Nevada	294	161	0	455	11	149	0	160				0
New Hampshire	2	7	0	9	7	4	0	10	0	0	0	0
New Jersey	0	0	8	8	0	0	302	302	0	0	30	30
New Mexico	114	107	0	221	26	71	0	97	156	266	0	422
New York				0			93	93				0
North Carolina				0			700	700				0
North Dakota	0	349	0	349	18	382	0	399	0	23	0	23
Ohio	130	109	0	240	186	322	0	508	2	0	0	2
Ohio River Valley				0				0				0
Oklahoma	83	22	0	104	80	867	0	947	560	2,100	0	2,661
Oregon				0	0	505	0	505				0
Pennsylvania	0	0	38	38	0	0	424	424				0
Puerto Rico	7	0	0	7	26	115	0	142				0
Rhode Island				0	47	89	0	137				0
South Carolina	7	162	0	169	1,212	1,279	0	2,491				0
South Dakota	1,168	263	0	1,431	0	150	0	150				0
Tennessee				0	1,058	2,234	0	3,292				0
Texas	40	148	0	188	259	518	0	777	0	24	0	24
Torres-Martinez Desert Band			1.9	1.9				0				0
Twenty-Nine Palms Band				0			1	1				0
Utah	74	1,181	0	1,254	0	65	0	65				0
Vermont	2	14	0	16	5	4	0	9				0
Virginia	242	290	0	532	131	210	0	341				0
Washington	0	0	7,858	7,858	0	0	4,210	4,210				0
West Virginia	4	2	0	6	230	897	0	1,126	2	0	0	2
Wisconsin	29	1,267	0	1,295	102	468	0	571	0	217	0	217
Wyoming				0				0				0
Yavapai-Prescott Reservation	2.1	0	0	2.1	0	2.1	0	2.1				0
Total	**7,437**	**11,980**	**13,587**	**33,004**	**5,747**	**20,060**	**6,504**	**32,310**	**3,123**	**20,784**	**7,250**	**31,156**

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	7 - Municipal Point Souces				8 - Animal Feeding Operations				9 - Resource Extraction			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Mississippi	24	877	0	901	12	12,446	0	12,458	28	408	0	436
Missouri	0	0	91	91				0	0	0	172	172
Montana			1,315	1,315			102	102			2,317	2,317
N Mariana Islands				0				0				0
Nebraska	869	41	0	910				0				0
Nevada				0				0				0
New Hampshire	1	7	0	8	7	0	0	7	0	0	0	0
New Jersey	0	0	123	123	0	0	6	6				0
New Mexico	14	27	0	41				0	173	395	0	569
New York			109	109				0			79	79
North Carolina				0				0			61	61
North Dakota	0	287	0	287	14	3,300	0	3,313	0	78	0	78
Ohio	515	282	0	798	19	9	0	28	393	50	0	444
Ohio River Valley				0				0				0
Oklahoma				0	203	895	0	1,098	430	1,332	0	1,762
Oregon				0				0				0
Pennsylvania	0	0	186	186				0	0	0	1,827	1,827
Puerto Rico	20	12	0	32				0	0	45	0	45
Rhode Island	16	38	0	54	6	0	0	6	0	7	0	7
South Carolina	803	550	0	1,353				0	25	0	0	25
South Dakota	0	33	0	33				0	2	62	0	64
Tennessee	284	1,122	0	1,406	58	302	0	360	236	1,053	0	1,289
Texas	1,374	714	0	2,088	0	154	0	154				0
Torres-Martinez Desert Band			1	1				0				0
Twenty-Nine Palms Band			1	1				0				0
Utah	46	73	0	119				0	56	400	0	456
Vermont	7	0	0	7				0	10	0	0	10
Virginia	17	64	0	82				0	39	106	0	145
Washington	0	0	4,771	4,771				0	0	0	4,210	4,210
West Virginia	200	1,120	0	1,321	6	0	0	6	1,258	1,286	0	2,544
Wisconsin	181	1,411	0	1,591	114	694	0	808	5	106	0	111
Wyoming				0				0				0
Yavapai-Prescott Reservation	0	0	0	0				0				0
Total	**6,667**	**15,293**	**7,127**	**29,087**	**2,736**	**24,908**	**108**	**27,751**	**5,848**	**9,771**	**9,612**	**25,231**

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

	10 - Silviculture				11 - Land Disposal				12 - Range Grazing - Riparian and/or Upland			
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Mississippi	0	2,121	0	2,121	68	535	0	603				0
Missouri				0				0				0
Montana			1,716	1,716			139	139			6,653	6,653
N Mariana Islands				0				0				0
Nebraska				0				0				0
Nevada				0				0	0	49	0	49
New Hampshire	0	0	0	0	2	4	0	6				0
New Jersey	0	0	1	1	0	0	5	5				0
New Mexico	78	151	0	229	26	82	0	108	812	1,780	0	2,591
New York				0			610	610				0
North Carolina			151	151			225	225				0
North Dakota				0	0	6	0	6	201	3,046	0	3,247
Ohio	0	5	0	5	99	185	0	284	31	70	0	101
Ohio River Valley				0				0				0
Oklahoma	0	218	0	218	13	684	0	697	394	3,894	0	4,288
Oregon	0	7,707	0	7,707				0				0
Pennsylvania	0	0	3	3	0	0	43	43				0
Puerto Rico	0	0	0	0	267	417	0	684				0
Rhode Island				0	6	33	0	40				0
South Carolina	0	221	0	221	114	44	0	158				0
South Dakota				0	0	13	0	13				0
Tennessee	2	59	0	61	128	149	0	277				0
Texas				0	38	19	0	57	352	20	0	372
Torres-Martinez Desert Band				0				0				0
Twenty-Nine Palms Band				0				0				0
Utah				0				0				0
Vermont	1	0	0	1	3	24	0	26				0
Virginia	0	11	0	11	72	24	0	95				0
Washington	0	0	2,526	2,526	0	0	7,016	7,016				0
West Virginia	509	922	0	1,431	486	574	0	1,060				0
Wisconsin	0	489	0	489	17	53	0	70	0	5	0	5
Wyoming				0				0				0
Yavapai-Prescott Reservation				0				0				0
Total	**717**	**14,884**	**4,420**	**20,020**	**2,030**	**9,565**	**8,333**	**19,928**	**2,434**	**10,382**	**6,653**	**19,469**

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	13 - Habitat Modification (other than Hydro)				14 - Channelization				15 - Industrial Point Sources			
	Major	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Mississippi	0	593	0	593	16	34	0	50	34	417	0	451
Missouri				0	0	0	3,998	3,998				0
Montana			3,982	3,982			793	793			339	339
N Mariana Islands				0				0				0
Nebraska				0	8	0	0	8	67	93	0	160
Nevada				0				0				0
New Hampshire	0	12	0	12				0	14	5	0	19
New Jersey	0	0	4	4	0	0	11	11	0	0	129	129
New Mexico	700	1,523	0	2,223	119	106	0	225	81	166	0	247
New York			344	344				0			60	60
North Carolina				0				0				0
North Dakota	184	1,471	0	1,656	63	287	0	349	0	57	0	57
Ohio	125	131	0	256	583	263	0	846	179	79	0	258
Ohio River Valley				0				0				0
Oklahoma	320	1,014	0	1,334	30	657	0	687	0	43	0	43
Oregon	0	2,103	0	2,103				0				0
Pennsylvania	0	0	217	217				0	0	0	114	114
Puerto Rico	0	0	0	0				0	25	19	0	44
Rhode Island	5	8	0	14				0	16	10	0	26
South Carolina				0				0	906	296	0	1,202
South Dakota				0				0	11		0	11
Tennessee	67	562	0	629	1,610	4,442	0	6,052	308	728	0	1,036
Texas				0				0	100	122	0	222
Torres-Martinez Desert Band				0				0				0
Twenty-Nine Palms Band			1	1				0				0
Utah	22	554	0	576				0	0	93	0	93
Vermont	38	42	0	81	3	0	0	3				0
Virginia	7	18	0	26				0	5	22	0	27
Washington				0				0	0	0	1,964	1,964
West Virginia	94	240	0	334	79	89	0	168	338	742	0	1,080
Wisconsin	87	925	0	1,011	121	621	0	743	123	1,127	0	1,250
Wyoming				0				0				0
Yavapai-Prescott Reservation				0				0	0.3	0	0	0.3
Total	**2,169**	**11,713**	**4,569**	**18,451**	**3,024**	**9,677**	**4,802**	**17,503**	**3,409**	**7,335**	**3,051**	**13,795**

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

Jurisdiction	16 - Construction				17 - Onsite WW Systems (Septic Tanks)				18 - Pasture Grazing - Riparian and/or Upland			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Mississippi	0	86	0	86	68	532	0	599	0	606	0	606
Missouri				0				0				0
Montana			1,269	1,269			139	139				0
N Mariana Islands				0				0				0
Nebraska				0				0				0
Nevada	0	63	0	63				0	0	13	0	13
New Hampshire	0	0	0	0	0	0	0	0				0
New Jersey	0	0	35	35	0	0	5	5				0
New Mexico	42	110	0	152	26	69	0	95	7	0	0	7
New York			29	29			610	610				0
North Carolina			434	434				0				0
North Dakota	20	203	0	223				0	0	1,142	0	1,142
Ohio	89	148	0	237	50	144	0	194	61	17	0	78
Ohio River Valley				0				0				0
Oklahoma	0	280	0	280	0	368	0	368	394	3,842	0	4,236
Oregon				0				0				0
Pennsylvania	0	0	134	134	0	0	41	41				0
Puerto Rico	0	0	0	0				0				0
Rhode Island	0	27	0	27	0	30	0	30				0
South Carolina	0	84	0	84				0				0
South Dakota				0				0				0
Tennessee	563	1,376	0	1,939	128	98	0	226				0
Texas				0	0	19	0	19	25	31	0	56
Torres-Martinez Desert Band				0				0				0
Twenty-Nine Palms Band				0				0				0
Utah	0	0	0	0				0				0
Vermont	25	0	0	25	0	24	0	24				0
Virginia				0				0				0
Washington	0	0	2,526	2,526	0	0	7,016	7,016				0
West Virginia	475	566	0	1,041	78	686	0	764	327	372	0	699
Wisconsin	31	48	0	79				0	255	740	0	995
Wyoming				0				0				0
Yavapai-Prescott Reservation	0	0	0	0				0				0
Total	**1,653**	**6,331**	**4,452**	**12,436**	**874**	**3,123**	**7,834**	**11,831**	**1,262**	**9,335**	**0**	**10,597**

Appendix A-5. Leading Sources Impairing Assessed Rivers and Streams

	19 - Bank or Shoreline Modification				20 - Other				Comment
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	
Mississippi	0	524	0	524				0	
Missouri				0				0	
Montana			3,762	3,762				0	
N Mariana Islands				0				0	
Nebraska				0				0	
Nevada				0				0	
New Hampshire	0	0	0	0	0	0	0	0	Excludes the effects of a statewide fish consumption advisory for mercury.
New Jersey				0				0	Data based on a source assessment in 4 watershed management areas. Natural refers to impacts from geese. New Jersey notes that their cause and source assessment is preliminary and these numbers will be updated in the near future.
New Mexico	541	1,523	0	2,063				0	
New York			344	344			65	65	
North Carolina				0			178	178	
North Dakota	0	62	0	62				0	
Ohio	125	131	0	256	241	349	0	590	
Ohio River Valley				0				0	
Oklahoma	125	338	0	464	0	1	0	1	
Oregon				0				0	
Pennsylvania				0	0	0	211	211	
Puerto Rico				0				0	
Rhode Island				0				0	
South Carolina				0	2	0	0	2	
South Dakota				0				0	
Tennessee	0	250	0	250				0	
Texas				0				0	
Torres-Martinez Desert Band				0				0	
Twenty-Nine Palms Band				0				0	
Utah				0				0	
Vermont	38	42	0	81				0	
Virginia				0	1	32	0	33	
Washington				0	0	0	1,684	1,684	
West Virginia	94	240	0	334	5	33	0	37	
Wisconsin	87	480	0	567	0	43	0	43	
Wyoming				0				0	
Yavapai-Prescott Reservation				0				0	
Total	**1,308**	**4,472**	**4,114**	**9,894**	**768**	**4,375**	**2,495**	**7,638**	

Appendix B-1. Total Lake, Reservoir, and Pond Acres in the Nation

	Total Lake Acres	Significant Public Acres	Number Significant Lakes	Assessed Acres	Percent Assessed	Comment
Alabama	490,472	380,939	43	463,111	94%	
Alaska	12,787,200			4,719	0%	Entered estimate of total lake acres from 1986 305(b) report.
Arizona	352,588			77,102	22%	Arizona does not include lake acres on Indian lands in their estimate of total lake acres.
Arkansas	514,245	356,254	80	356,254	69%	
California	1,672,684			741,482	44%	
Colorado	164,029		1,533	59,660	36%	
Connecticut	64,973	27,108	115	27,108	42%	Connecticut assesses 18,604 acres of public water supply reservoirs separately.
Cortina Rancheria	0			0	100%	
Delaware	2,954			2,770	94%	
District of Columbia	238			238	100%	
Florida	2,085,120	2,085,120	7,712	1,005,184	48%	
Georgia	425,382	397,877	27	399,295	94%	
Guam	27	0	0	0	0%	The only lake on Guam is Fena Lake Reservoir, which is monitored by the Navy.
Hawaii	2,168	0	0	0	0%	
Idaho	700,000			0	0%	Idaho is currently developing a lake and reservoir beneficial use assessment process. The state has surveyed 40 public waters (173,044 ac) as part of a beneficial use reconnaisance
Illinois	309,340	172,543	1,170	188,288	61%	
Indiana	142,871	106,205	575	45,135	32%	Does not include Indiana portion of Lake Michigan (154,000 acres).
Iowa	161,366	41,190	115	83,343	52%	
Kansas	181,337	181,337	307	181,337	100%	Entered size of significant public lakes, a subset total lake acreage, because the State did not report total lake acreage.
Kentucky	228,385		105	218,438	96%	Kentucky reports an unknown total acreage of lakes and reservoirs. This value is from their 1996 305(b) report.
Louisiana	1,078,031	474,506	62	376,215	35%	
Maine	987,283	958,886	2,314	987,283	100%	
Manzanita Band	2			0	0%	
Maryland	77,965	21,010	58	21,010	27%	
Massachusetts	151,173			85,179	56%	Total lake acres includes Quabbin Reservoir (25,000 acres).
Michigan	889,600	491,931	730	491,931	55%	
Minnesota	3,290,101			2,531,239	77%	
Mississippi	500,000			289,459	58%	
Missouri	292,204	292,204	415	292,204	100%	
Montana	844,802	833,964	7,004	797,190	94%	Surveyed acres are based on aquatic life use support data. State reports assessing a total of 798,583 acres for all uses.
Nebraska	280,000	152,589	514	127,043	45%	
Nevada	533,239	362,331	21	320,906	60%	

Appendix B-1. Total Lake, Reservoir, and Pond Acres in the Nation

	Total Lake Acres	Significant Public Acres	Number Significant Lakes	Assessed Acres	Percent Assessed	Comment
New Hampshire	170,009	156,036	687	161,464	95%	
New Jersey	24,000	24,000	380	10,462	44%	Entered size of public lakes, a subset total lake acreage, because the State did not report total lake acreage.
New Mexico	997,467	135,410	170	154,550	15%	New Mexico also assessed 236 lake acres as unknown degree of use support.
New York	790,782	790,782	7,849	790,782	100%	
North Carolina	311,236	311,236	161	311,236	100%	
North Dakota	660,097	220	660,097	640,591	97%	
Ohio	188,461	118,801	447	0	0%	
Oklahoma	1,041,884	645,286	2,337	591,482	57%	
Oregon	618,934	491,518	203	580,017	94%	
Pennsylvania	161,445	94,530	179	0	0%	
Puerto Rico	12,111	6,678	18	12,111	100%	Puerto Rico reported an atlas value of 10,881 total lake acres.
Rhode Island	21,300			15,921	75%	
South Carolina	366,576	476,127	46	211,462	58%	South Carolina based its acreages on RF3 data, which does not include lakes along the state boundary and many lakes constructed in recent decades.
South Dakota	750,000	750,000	799	132,159	18%	
Tennessee	538,060			537,261	100%	Entered size of public lakes, a subset total lake acreage, because the State did not report total lake acreage.
Texas	3,065,600	1,536,939	99	1,535,820	50%	
Torres-Martinez Desert Band	9,600			9,600	100%	Assessment is for the Salton Sea.
Utah	481,638			460,561	96%	
Vermont	228,915		809	16,352	7%	Vermont reported only on those lakes that were reassessed during the 1996-1997 reporting period.
Virginia	149,982	149,982	104	140,080	93%	Entered size of significant public lakes, a subset of total lake acreage, because the state did not report total lake acreage.
Washington	466,296			248,683	53%	
West Virginia	22,373	22,373	108	21,523	96%	Entered size of significant public lakes, a subset of total lake acreage, because state did not report total lake acreage. In its 305(b) report, WV reported on lakes assessed for the 1998 cycle. The data presented here include some older assessments.
Wisconsin	982,155	982,155	15,057	635,132	65%	Does not include Great Lake acres.
Wyoming	325,048	299,152	2,433	0	0%	
Total	41,593,748	14,327,218	714,883	17,390,370		
				42%		

Appendix B-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support - Evaluated	Full Support - Monitored	Full Support - Not Specified	Full Support - Total	Threatened - Evaluated	Threatened - Monitored	Threatened - Not Specified	Threatened - Total	Impaired - Evaluated	Impaired - Monitored	Impaired - Not Specified	Impaired - Total
Alabama	17,215	289,238	0	306,453	0	25,150	0	25,150	11,165	120,343	0	131,508
Alaska	0	0	0	0				0	857	3,862	0	4,719
Arizona	14,132	21	0	14,153	2,706	34,340	0	37,046	10,482	15,421	0	25,903
Arkansas	0	333,698	0	333,698				0	0	22,556	0	22,556
California	127,107	88,112	0	215,219	5,079	54,630	0	59,709	39,668	426,886	0	466,554
Colorado			52,672	52,672				0			6,988	6,988
Connecticut	2,978	16,355	0	19,333	1,546	4,972	0	6,518	0	1,256	0	1,256
Cortina Rancheria	0	0	0	0	0	0	0	0	0	0	0	0
Delaware	0	0	0	0	0	0	0	0	813	1,957	0	2,770
District of Columbia	0	0	0	0	0	0	0	0	0	238	0	238
Florida	0	305,728	0	305,728	0	44,416	0	44,416	0	655,040	0	655,040
Georgia	5,551	52,583	0	58,134				0	34,408	306,753	0	341,161
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	4,408	3,623	0	8,031	31,658	6,704	0	38,362	98,038	43,857	0	141,895
Indiana	0	0	0	0	0	0	0	0	0	45,135	0	45,135
Iowa (flood control reservoirs)	0	10,300	0	10,300	0	30,000	0	30,000	0	0	0	0
Iowa (lakes)	806	8,987	0	9,793	4,871	12,635	0	17,506	9,035	6,709	0	15,744
Kansas	0	0	0	0	8,136	52,821	0	60,957	3,487	116,893	0	120,380
Kentucky	0	101,739	0	101,739	0	97,779	0	97,779	0	18,920	0	18,920
Louisiana	2,330	28,582	0	30,912	5,894	0	0	5,894	19,601	319,808	0	339,409
Maine	0	0	0	0	0	0	0	0	987,283	0	0	987,283
Manzanita Band				0				0				0
Maryland	0	7,765	0	7,765				0	0	13,245	0	13,245
Mass (Quabbin Res)	0	0	0	0	0	0	0	0	0	25,000	0	25,000
Massachusetts	331	22,142	0	22,473	590	382	0	972	6,727	29,408	0	36,135
Michigan	0	393,328	0	393,328	0	1,625	0	1,625	0	96,978	0	96,978
Minnesota	463,137	993,113	0	1,456,250	22,053	215,788	0	237,841	185,878	651,270	0	837,148
Mississippi	8,396	149,820	0	158,216	1,726	94,625	0	96,351	6,453	28,439	0	34,891
Missouri	15,232	116,971	0	132,203	11,332	105,484	0	116,816	525	42,660	0	43,185
Montana			113,964	113,964				0			683,226	683,226
Nebraska	1,723	55,167	0	56,890	4,417	45,661	0	50,078	303	19,772	0	20,075
Nevada	236,779	29,220	0	265,999				0	14,892	40,015	0	54,907
New Hampshire	125,384	29,507	0	154,891				0	4,161	2,412	0	6,573

Appendix B-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Not Attainable - Evaluated	Not Attainable - Monitored	Not Attainable - Not Specified	Not Attainable - Total	Total Evaluated	Total Monitored	Total Unspecified	Total Assessed	Comment
Alabama				0	28,380	434,731	0	463,111	
Alaska				0	857	3,862	0	4,719	State reported overall use support status. Alaska's assessment data is biased towards those waters with known impairment; efforts are underway to assess other waters across the state.
Arizona				0	27,320	49,782	0	77,102	
Arkansas				0	0	356,254	0	356,254	Impaired waters include 5456 miles of "waters of concern" because of fish tissue consumption limitations.
California				0	171,854	569,628	0	741,482	
Colorado				0	0	0	59,660	59,660	
Connecticut	0	0	0	0	4,524	22,584	0	27,108	State reported overall use support status. Excludes the effect of a statewide fish consumption advisory for mercury.
Cortina Rancheria	0	0	0	0	0	0	0	0	
Delaware				0	813	1,957	0	2,770	
District of Columbia				0	0	238	0	238	
Florida				0	0	1,005,184	0	1,005,184	State reported overall use support status.
Georgia				0	39,959	359,336	0	399,295	
Guam				0	0	0	0	0	
Hawaii				0	0	0	0	0	
Idaho				0	0	0	0	0	Idaho is currently developing a lake and reservoir beneficial use assessment process.
Illinois				0	134,104	54,184	0	188,288	State reported overall use support status.
Indiana	0	0	0	0	0	45,135	0	45,135	
Iowa (flood control reservoirs)				0	0	40,300	0	40,300	
Iowa (lakes)				0	14,712	28,331	0	43,043	
Kansas	0	0	0	0	11,623	169,714	0	181,337	
Kentucky	0	0	0	0	0	218,438	0	218,438	
Louisiana				0	27,825	348,390	0	376,215	
Maine				0	987,283	0	0	987,283	All lakes in Maine are considered inpaired due to a statewide fish consumption advisory.
Manzanita Band				0	0	0	0	0	
Maryland				0	0	21,010	0	21,010	
Mass (Quabbin Res)				0	0	25,000	0	25,000	
Massachusetts	25	574	0	599	7,673	52,506	0	60,179	Quabbin Reservoir (25,000 acres) is reported separately.
Michigan				0	0	491,931	0	491,931	State reported overall use support status. Excludes the effect of a statewide fish consumption advisory for mercury. "Impaired" inc. 42,939 ac not supporting fish consumption use b/c of mercury contamination as based on site specific info vs. generic.
Minnesota	0	0	0	0	671,068	1,860,171	0	2,531,239	
Mississippi	0	0	0	0	16,575	272,884	0	289,459	
Missouri				0	27,089	265,115	0	292,204	
Montana				0	0	0	797,190	797,190	Entered aquatic life use support in lieu of summary use support.
Nebraska				0	6,443	120,600	0	127,043	
Nevada				0	251,671	69,235	0	320,906	
New Hampshire	0	0	0	0	129,545	31,919	0	161,464	Excludes the effect of a statewide fish consumption advisory for mercury.

Appendix B-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support - Evaluated	Full Support - Monitored	Full Support - Not Specified	Full Support - Total	Threatened - Evaluated	Threatened - Monitored	Threatened - Not Specified	Threatened - Total	Impaired - Evaluated	Impaired - Monitored	Impaired - Not Specified	Impaired - Total
New Jersey	0	0	0	0	0	111	0	111	0	10,351	0	10,351
New Mexico	11,751	18,659	0	30,410				0	95,598	28,542	0	124,140
New York			375,488	375,488			108,586	108,586			306,708	306,708
North Carolina			210,784	210,784			94,812	94,812			5,640	5,640
North Dakota	128,385	21,306	0	149,691	2,452	2,994	0	5,446	9,541	475,914	0	485,454
Ohio				0				0				0
Oklahoma	8,684	90,103	0	98,787	33,587	186,978	0	220,565	25,120	247,010	0	272,130
Oregon	8,948	364,144	0	373,092	83,975	0	0	83,975	0	122,950	0	122,950
Pennsylvania				0				0				0
Puerto Rico	2,228	0	0	2,228	0	1,707	0	1,707	0	8,176	0	8,176
Rhode Island	4,718	1,781	0	6,499	851	6,355	0	7,206	1,241	975	0	2,216
South Carolina	0	192,643	0	192,643				0	0	18,819	0	18,819
South Dakota	0	21,211	0	21,211				0	0	110,948	0	110,948
Tennessee	0	0	417,338	417,338				0	0	0	119,923	119,923
Texas	0	1,083,136	0	1,083,136	0	0	0	0	0	452,684	0	452,684
Torres-Martinez Desert Band			0	0			0	0			9,600	9,600
Utah	0	297,839	0	297,839	0	0	0	0	0	162,722	0	162,722
Vermont	0	0	1,765	1,765	0	0	2,239	2,239	0	0	12,348	12,348
Virginia	1,810	130,188	0	131,998	0	8,082	0	8,082	0	0	0	0
Washington	0	162,482	0	162,482				0	0	86,201	0	86,201
West Virginia	3	2,279	0	2,282	0	4,504	0	4,504	2	14,734	0	14,736
Wisconsin			141,669	141,669			100,922	100,922			392,541	392,541
Wyoming				0				0				0
Total	1,192,037	5,421,770	1,313,680	7,927,486	220,872	1,037,744	306,559	1,565,175	1,565,278	4,794,858	1,536,974	7,897,110
	7%	31%	8%	46%	1%	6%	2%	9%	9%	28%	9%	45%

Appendix B-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Not Attainable - Evaluated	Not Attainable - Monitored	Not Attainable - Not Specified	Not Attainable - Total	Total Evaluated	Total Monitored	Total Unspecified	Total Assessed	Comment
New Jersey				0	0	10,462	0	10,462	NJ lakes are assessed at the request of local communities when there is a public perception of impairment, by evaluating of trophic status and recreational water quality. Thus all public lakes are at least threatened with deteriorating water quality.
New Mexico	0	0	0	0	107,349	47,201	0	154,550	State reported overall use support. Of the "fully supporting" acres, 25752 acres were reported as "fully supporting, impacts observed."
New York				0	0	0	790,782	790,782	
North Carolina				0	0	0	311,236	311,236	
North Dakota				0	140,378	500,213	0	640,591	
Ohio				0	0	0	0	0	
Oklahoma				0	67,391	524,091	0	591,482	
Oregon				0	92,923	487,094	0	580,017	
Pennsylvania				0	0	0	0	0	
Puerto Rico	0	0	0	0	2,228	9,883	0	12,111	
Rhode Island	0	0	0	0	6,810	9,111	0	15,921	
South Carolina				0	0	211,462	0	211,462	South Carolina included the effects of a statewide fish consumption advisory for mercury in those basins assessed during 1996 and 1997, but did not for those basins assessed previously.
South Dakota				0	0	132,159	0	132,159	
Tennessee				0	0	0	537,261	537,261	
Texas	0	0	0	0	0	1,535,820	0	1,535,820	
Torres-Martinez Desert Band				0	0	0	9,600	9,600	
Utah	0	0	0	0	0	460,561	0	460,561	
Vermont				0	0	0	16,352	16,352	State reported overall use support. Excludes the effect of a statewide fish consumption advisory for mercury.
Virginia				0	1,810	138,270	0	140,080	
Washington				0	0	248,683	0	248,683	State reported overall use support status.
West Virginia	0	0	0	0	5	21,517	0	21,523	
Wisconsin				0	0	0	635,132	635,132	
Wyoming				0	0	0	0	0	
Total	25	574	0	599	2,978,212	11,254,945	3,157,213	17,390,370	
	0%	0%	0%	0%	17%	65%	18%		

Appendix B-3a. Aquatic Life Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	308,991	69,219	76,895	8,010	0	463,115	
Alaska						0	
Arizona	14,137	37,088	25,013	864		77,102	Entered "aquatic and wildlife overall" use support status.
Arkansas	356,254		0	0		356,254	
California	172,114	57,267	326,814	127,053		683,248	
Colorado	52,672		6,688	300		59,660	
Connecticut	23,957	2,826	325	0	0	27,108	
Cortina Rancheria						0	
Delaware	2,071		461	421		2,954	
District of Columbia	136	0	0	103	0	238	
Florida	295,616	44,416	224,768	77,632		642,432	
Georgia	292,911		97,871	8,518		399,300	
Guam						0	
Hawaii						0	
Idaho						0	Idaho is currently developing a lake and reservoir beneficial use assessment process.
Illinois	78,619	18,656	85,812	5,016		188,103	
Indiana	6,725	6,730	0	0	0	13,455	
Iowa (flood control reservoirs)	10,300	30,000	0	0		40,300	
Iowa (lakes)	13,392	13,520	14,718	123		41,753	
Kansas	0	92,951	85,137	3,249	0	181,337	
Kentucky	160,400	52,179	4,807	94		217,480	
Louisiana	29,811	5,894	253,512	85,897		375,114	
Maine	726,103	158,821	102,359	0		987,283	
Manzanita Band						0	
Maryland	7,814		13,195	0		21,010	
Mass (Quabbin Res)	25,000	0	0	0	0	25,000	
Massachusetts	1,802	628	24,685	389	599	28,103	Does not include Quabbin Reservoir.
Michigan				8,154		8,154	Entered "warm water aquatic life" use support status. MI reports an unknown acreage supports aquatic life use.
Minnesota						0	
Mississippi	180,228	87,824	6,446	0	0	274,497	
Missouri	289,484		50	2,670		292,204	
Montana	113,964		683,226	0		797,190	
Nebraska	83,356	15,629	22,685	55		121,725	
Nevada	157,429		16,107	38,800		212,336	
New Hampshire	156,256		2,810	2,398	0	161,464	
New Jersey						0	
New Mexico	13,693		111,116	18	0	124,827	Of the "fully supporting" acres, 13019 acres were reported as "fully supporting, impacts observed."
New York	741,390	9,599	34,261	5,532		790,782	
North Carolina	210,784	94,922	5,113	417		311,236	

Appendix B-3a. Aquatic Life Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
North Dakota	155,805	460,177	24,609	0		640,591	
Ohio						0	
Oklahoma	129,556	213,453	230,685	32,372		606,066	
Oregon	470	45,725	0	86,104		132,299	
Pennsylvania						0	
Puerto Rico	2,228	0	0	9,883	0	12,111	Entered "propogation and preservation of desirable species" use support status.
Rhode Island	6,895	6,805	1,670	533		15,903	
South Carolina	195,005		5,127	11,330		211,462	
South Dakota	21,211		33,719	77,229	0	132,159	
Tennessee	487,303		13,686	37,596		538,585	
Texas	1,173,664	0	96,010	49,045	0	1,318,719	
Torres-Martinez Desert Band	0	0	9,600	0		9,600	
Utah	297,839	0	157,033	5,689	0	460,561	
Vermont	3,785	5,701	3,865	2,992		16,343	
Virginia	131,997	8,082	0	0		140,079	
Washington						0	
West Virginia	2,284	4,504	13,005	1,730	0	21,523	
Wisconsin	23,613	1,857	35,304	3,736		64,510	
Wyoming						0	
Total	7,157,064	1,544,472	2,849,187	693,952	599	12,245,274	
	58%	13%	23%	6%	0%		

Appendix 3-b. Fish Consumption Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	362,033	25,150	41,435	34,493	0	463,111	
Alaska						0	
Arizona	53,448	20,701	2,376	555		77,080	
Arkansas	331,972			18,722		350,694	
California	135,387	60,136	169,644	125,177		490,343	
Colorado	6,082		6,053	20		12,155	
Connecticut	23,904	0	3,203	0	0	27,108	Excludes the effect of a statewide fish consumption advisory for mercury.
Cortina Rancheria						0	
Delaware						0	
District of Columbia	0	0	0	238	0	238	
Florida	0	0	69,504	0		69,504	
Georgia	37,357		268,109	55,950		361,416	
Guam						0	
Hawaii						0	
Idaho						0	Idaho is currently developing a lake and reservoir beneficial use assessment process.
Illinois	98,500	0	17,685	11,629		127,814	
Indiana	0	0	43,178	1,957	0	45,135	
Iowa (flood control reservoirs)	40,300	0	0	0		40,300	
Iowa (lakes)	27,159	0	0	164		27,323	
Kansas	0	45,106	0	1	0	45,107	
Kentucky	197,502	0	8,210	0		205,712	
Louisiana						0	
Maine	0	0	987,283	0		987,283	
Manzanita Band						0	
Maryland	20,910		100	0		21,010	
Mass (Quabbin Res)	0	0	0	25,000	0	25,000	
Massachusetts	193	0	0	9,687	599	10,479	Does not include Quabbin Reservoir.
Michigan				43,820		43,820	MI reports an unknown acreage supports fish consumption use.
Minnesota						0	
Mississippi	126,782	117,109	28,400	46	0	272,337	
Missouri	258,675		0	940		259,615	
Montana						0	
Nebraska	73,049	50,123	0	0		123,172	
Nevada						0	
New Hampshire	170,009		0	0	0	170,009	Excludes the effect of a statewide fish consumption advisory for mercury.
New Jersey						0	

Appendix 3-b. Fish Consumption Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
New Mexico	410		109,499	0	0	109,909	All of the "fully supporting" acres were reported as "fully supporting, impacts observed."
New York	641,322	0	149,285	175		790,782	
North Carolina						0	
North Dakota	0	0	464,319	0		464,319	
Ohio						0	
Oklahoma						0	
Oregon	0	9,612	0	21,208		30,820	
Pennsylvania						0	
Puerto Rico						0	Category not applicable.
Rhode Island						0	
South Carolina						0	
South Dakota	469,297		0	0	0	469,297	
Tennessee	453,161		10,370	73,730		537,261	
Texas	111,055	0	336,600	500	0	448,155	
Torres-Martinez Desert Band	0	0	0	9,600		9,600	
Utah	460,561	0	0	0	0	460,561	
Vermont	6,486	0	3,460	6,225		16,171	
Virginia	70,794	69,268	0	0		140,062	
Washington						0	
West Virginia	91	0	0	0	0	91	
Wisconsin	62,143	0	0	43,453		105,596	
Wyoming						0	
Total	4,238,581	397,205	2,718,712	483,290	599	7,838,388	
	54%	5%	35%	6%	0%		

Appendix B-3c. Swimming Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	317,693	80,188	16,955	200	0	415,036	Entered "swimming and secondary contact" use support status.
Alaska						0	
Arizona	69,552	5,584	1,277	450		76,863	
Arkansas	356,254		0	0		356,254	
California	167,891	73,510	308,452	125,884		675,736	
Colorado						0	
Connecticut	17,339	9,501	268	0	0	27,108	
Cortina Rancheria						0	
Delaware	596		1,170	1,188		2,954	
District of Columbia	0	0	0	238	0	238	
Florida	295,616	44,416	224,768	77,632		642,432	
Georgia	379,018		20,277	0		399,295	
Guam						0	
Hawaii						0	
Idaho						0	Idaho is currently developing a lake and reservoir beneficial use assessment process.
Illinois	16,581	23,502	88,664	59,530		188,277	
Indiana						0	
Iowa (flood control reservoirs)	10,300	30,000	0	0		40,300	
Iowa (lakes)	9,788	18,588	10,123	162		38,661	
Kansas	0	88,630	88,362	4,345	0	181,337	
Kentucky	206,513	0	219	0		206,732	
Louisiana	340,371	0	24	9,248		349,643	
Maine	717,262	219,154	50,867	0		987,283	
Manzanita Band						0	
Maryland	4,928		46	49		5,023	Includes only lakes where swimming is a defined function.
Mass (Quabbin Res)	25,000	0	0	0	0	25,000	
Massachusetts	2,082	4,650	5,017	7,218	599	19,566	Does not include Quabbin Reservoir.
Michigan	489,866			2,065		491,931	
Minnesota	1,456,250	237,841	509,618	327,530	0	2,531,239	
Mississippi	31,823	0	100	0	0	31,923	
Missouri	261,451		0	0		261,451	
Montana	457,556		337,228	3,800		798,584	
Nebraska	109,656	0	150	0		109,806	
Nevada	173,434		10	0		173,444	
New Hampshire	159,815		1,386	0	0	161,201	
New Jersey						0	
New Mexico						0	
New York	666,251	24,450	95,817	4,264		790,782	
North Carolina	118,205	86,770	4,913	200		210,088	
North Dakota	135,106	391,010	99,474	0		625,591	

Appendix B-3c. Swimming Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Ohio						0	
Oklahoma	49,587	275,044	192,351	30,990		547,972	
Oregon	1,870	13,983	0	7,846		23,699	
Pennsylvania						0	
Puerto Rico	8,445	0	582	3,084	0	12,111	
Rhode Island	10,965	3,964	146	485		15,560	
South Carolina	211,134		28	299		211,462	
South Dakota	591,490		5,631	0	0	597,121	
Tennessee	521,133		5,237	10,891		537,261	Entered "recreation" use support status.
Texas	1,202,707	0	0	37,525	0	1,240,232	
Torres-Martinez Desert Band	0	0	0	9,600		9,600	
Utah	161,760	0	0	1,000	0	162,760	
Vermont	9,363	3,263	1,765	1,872		16,263	
Virginia	139,759	0	0	0		139,759	
Washington						0	
West Virginia	18,823	2,700	0	0	0	21,523	
Wisconsin	13,867	2,853	34,560	3,491		54,771	
Wyoming						0	
Total	9,937,100	1,639,601	2,105,485	731,086	599	14,413,872	
	69%	11%	15%	5%	0%		

Appendix B-3d. Secondary Contact Recreational Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	317,693	80,188	16,955	200	0	415,036	Entered "swimming and secondary contact" use support status.
Alaska						0	
Arizona	61	14	10	0		85	
Arkansas	356,254		0	0		356,254	
California	181,286	60,501	307,165	125,457		674,408	
Colorado						0	
Connecticut						0	
Cortina Rancheria						0	
Delaware	1,545		1,251	158		2,954	
District of Columbia	108	0	130	0	0	238	
Florida	295,616	44,416	224,768	77,632		642,432	
Georgia	399,295		0	0		399,295	
Guam						0	
Hawaii						0	
Idaho						0	Idaho is currently developing a lake and reservoir beneficial use assessment process.
Illinois	9,791	75	115,641	62,596		188,103	Entered "recreation" use support status.
Indiana						0	
Iowa (flood control reservoirs)						0	
Iowa (lakes)						0	
Kansas	0	166,728	11,724	2,885	0	181,337	
Kentucky	110,873	93,700	3,980	0		208,553	
Louisiana	340,371	0	0	9,248		349,619	
Maine	987,283	0	0	0		987,283	
Manzanita Band						0	
Maryland						0	
Mass (Quabbin Res)	25,000	0	0	0	0	25,000	
Massachusetts	36,570	5,751	3,569	7,105	599	53,594	Does not include Quabbin Reservoir.
Michigan	491,931			0		491,931	
Minnesota						0	
Mississippi	18,521	0	100	0	0	18,621	
Missouri						0	
Montana						0	
Nebraska						0	
Nevada	212,244		92	0		212,336	
New Hampshire	170,009		0	0	0	170,009	
New Jersey						0	
New Mexico	201		127	13	0	341	All of the "fully supporting" acres were reported as "fully supporting, impacts observed."
New York	771,775	9,090	9,007	910		790,782	
North Carolina	210,784	94,922	5,113	417		311,236	

Appendix B-3d. Secondary Contact Recreational Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	**Full Support**	**Threatened**	**Partial Support**	**Not Supporting**	**Not Attainable**	**Total Assessed**	**Comment**
North Dakota						0	
Ohio						0	
Oklahoma						0	
Oregon	1,870	13,983	0	7,846		23,699	
Pennsylvania						0	
Puerto Rico	9,661	0	249	2,450	0	12,360	
Rhode Island						0	
South Carolina						0	
South Dakota	596,959		162	0	0	597,121	
Tennessee						0	
Texas						0	
Torres-Martinez Desert Band	0	0	9,600	0		9,600	
Utah	161,760	0	0	1,000	0	162,760	
Vermont	6,637	3,230	4,579	1,872		16,318	
Virginia						0	
Washington						0	
West Virginia	18,775	2,700	48	0	0	21,523	
Wisconsin						0	
Wyoming						0	
Total	5,732,873	575,298	714,270	299,789	599	7,322,828	
	78%	8%	10%	4%	0%		

Appendix B-3e. Drinking Water Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	29,743	40,436	0	0	0	70,179	
Alaska						0	
Arizona	56,819	5	0	0		56,824	
Arkansas	356,254		0	0		356,254	
California	166,967	20,569	292,980	203		480,719	
Colorado						0	
Connecticut						0	Connecticut assesses 18,604 acres of public drinking water supply separately.
Cortina Rancheria						0	
Delaware	296		0	0		296	
District of Columbia						0	
Florida	10,112	0	352,640	0		362,752	
Georgia	399,295		0	0		399,295	
Guam						0	
Hawaii						0	
Idaho						0	Idaho is currently developing a lake and reservoir beneficial use assessment process.
Illinois	45,028	700	31,218	0		76,946	
Indiana						0	
Iowa (flood control reservoirs)	0	11,000	0	0		11,000	
Iowa (lakes)	10,516	1,214	337	50		12,117	
Kansas	0	85,326	58,094	37,917		181,337	
Kentucky	190,994	0	2,508	458		193,960	
Louisiana	196,723	0	0	0		196,723	
Maine	987,283	0	0	0		987,283	
Manzanita Band						0	
Maryland	9,651		0	0		9,651	Includes only lakes where drinking water source is a defined function.
Mass (Quabbin Res)	25,000	0	0	0	0	25,000	
Massachusetts						0	
Michigan						0	
Minnesota						0	
Mississippi						0	
Missouri	61,084		1,478	36,557		99,119	
Montana	463,563		18,195	315,428		797,186	
Nebraska						0	
Nevada	158,634		14,810	0		173,444	
New Hampshire	11,699		0	0	0	11,699	Acreage reflects lakes/ponds currently used as public water supplies.
New Jersey						0	
New Mexico						0	
New York	353,007	59,127	5,853	0		417,987	
North Carolina	93,502	75,857	4,928	38		174,325	

Appendix B-3e. Drinking Water Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	**Full Support**	**Threatened**	**Partial Support**	**Not Supporting**	**Not Attainable**	**Total Assessed**	**Comment**
North Dakota	368,982	0	1,637	0		370,619	
Ohio						0	
Oklahoma	56,145	6,306	8,800	0		71,251	
Oregon						0	
Pennsylvania						0	
Puerto Rico	2,687	0	1,000	3,656	0	7,343	Entered "raw source of drinking water supply" use support status.
Rhode Island	4,537	1,084	61	0		5,682	
South Carolina						0	
South Dakota	493,098		0	0	0	493,098	
Tennessee	511,876		34	0		511,910	
Texas	1,501,437	0	0	0	0	1,501,437	
Torres-Martinez Desert Band						0	
Utah	252,643	0	0	0	0	252,643	
Vermont	175	0	0	0		175	
Virginia	103,245	0	0	0		103,245	
Washington						0	
West Virginia	5,037	1,750	0	0	0	6,787	
Wisconsin						0	
Wyoming						0	
Total	6,926,031	303,374	794,573	394,307	0	8,418,286	
	82%	4%	9%	5%	0%		

Appendix B-3f. Agriculture Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	0	0	0	0	0	0	
Alaska						0	
Arizona	71,690	3,685	450	259		76,084	Entered "agricultural uses overall" use support status.
Arkansas	356,254		0	0		356,254	Entered "agricultural and industrial" use support status.
California	157,926	31,417	127,263	125,722		442,328	
Colorado						0	
Connecticut						0	
Cortina Rancheria						0	
Delaware	2,765		0	0		2,765	
District of Columbia						0	
Florida						0	
Georgia						0	
Guam						0	
Hawaii						0	
Idaho						0	Idaho is currently developing a lake and reservoir beneficial use assessment process.
Illinois						0	
Indiana	13,455	0	0	0	0	13,455	
Iowa (flood control reservoirs)						0	
Iowa (lakes)						0	
Kansas	0	164,756	11,434	5,147		181,337	Entered irrigation use support status.
Kentucky						0	
Louisiana						0	
Maine	987,283	0	0	0		987,283	
Manzanita Band						0	
Maryland						0	
Mass (Quabbin Res)						0	
Massachusetts						0	
Michigan	491,931			0		491,931	
Minnesota						0	
Mississippi						0	
Missouri						0	
Montana						0	
Nebraska	121,573	0	0	0		121,573	
Nevada	173,444		92	38,800		212,336	Entered "irrigation" use support status.
New Hampshire	170,009		0	0	0	170,009	
New Jersey						0	
New Mexico	12,863		12,110	1,942	0	26,915	Entered "livestock watering" use support status. All of the "fully supporting" acres were reported as "fully supporting, impacts observed."

Appendix B-3f. Agriculture Use Support in Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
New York						0	
North Carolina						0	
North Dakota						0	
Ohio						0	
Oklahoma	57,321	236	0	0		57,557	
Oregon						0	
Pennsylvania						0	
Puerto Rico						0	Category not applicable.
Rhode Island						0	
South Carolina						0	
South Dakota	562,092		4,693	0	0	566,785	
Tennessee	538,060			0		538,060	Entered "irrigation" use support status.
Texas						0	
Torres-Martinez Desert Band						0	
Utah	460,637	0	0	0	0	460,637	
Vermont	20	0	0	0		20	Entered "agricultural water supply" use support status.
Virginia						0	
Washington						0	
West Virginia						0	
Wisconsin						0	
Wyoming						0	
Total	4,177,323	200,094	156,042	171,870	0	4,705,329	
	89%	4%	3%	4%	0%		

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	1 - Nutrients				2 - Metals				3 - Siltation			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	6,085	0	0	6,085	1,850	0	0	1,850	60	0	0	60
Alaska				0			2	2				0
Arizona				0	18,530	14	0	18,544				0
Arkansas				0	17,100	5,560	0	22,660				0
California	188,280	12,511	0	200,791	120,000	180,527	0	300,527	120,000	12,715	0	132,715
Colorado				0			6,512	6,512				0
Connecticut				0	663	14,014	0	14,677	0	73	0	73
Cortina Rancheria				0				0				0
Delaware	0	150	0	150				0				0
District of Columbia				0				0	0	103	0	103
Florida	0	578,816	0	578,816	0	0	0	0				0
Georgia				0	4,257	186,358	0	190,615				0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	42,204	98,893	0	141,097	7,477	13,802	0	21,279	62,366	75,433	0	137,799
Indiana				0	802	42,336	0	43,138				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)	48	4,893	0	4,941				0	0	3,896	0	3,896
Kansas	21,818	142,748	0	164,566	349	245	0	594				0
Kentucky	7,217	0	0	7,217	586	0	0	586				0
Louisiana	0	16,832	0	16,832	0	326,027	0	326,027	0	51,840	0	51,840
Maine	3,251	53,972	0	57,223				0	0	38,890	0	38,890
Manzanita Band				0				0				0
Maryland	0	13,040	0	13,040				0	108	100	0	208
Massachusetts	0	0	266	266	0	0	8,700	8,700	0	0	113	113
Michigan	6,102	0	0	6,102	42,067	0	0	42,067				0
Minnesota	0	837,148	0	837,148				0				0
Mississippi	0	6,446	0	6,446	0	28,340	0	28,340	0	5,738	0	5,738
Missouri	0	0	1,478	1,478	0	0	10,000	10,000				0
Montana			452,446	452,446			32,739	32,739			67,137	67,137
Nebraska	158	22,799	0	22,957	0	0	0	0	3,262	61,223	0	64,485
Nevada	0	14,800	0	14,800				0				0
New Hampshire	0	434	0	434	0	0	0	0	0	0	0	0

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	4 - Organic Enrichment/Low DO				5 - Mercury				6 - Suspended Solids			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	24,285	35,885	0	60,170				0				0
Alaska			1,137	1,137				0				0
Arizona	2,998	10	0	3,008	12,119	3	0	12,122				0
Arkansas				0	17,100	5,560	0	22,660				0
California	968	30,674	0	31,642	72,310	17,178	0	89,488	0	59	0	59
Colorado				0				0				0
Connecticut	975	268	0	1,243				0				0
Cortina Rancheria				0				0				0
Delaware				0				0				0
District of Columbia	103	27	0	130				0	0	103	0	103
Florida				0				0				0
Georgia	45	0	0	45				0				0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	35,524	81,543	0	117,067				0	72,999	63,304	0	136,303
Indiana	0	4,440	0	4,440				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)	93	10,644	0	10,737				0				0
Kansas	7	9,429	0	9,436				0	50,118	1,045	0	51,163
Kentucky	0	0	0	0				0	3,040	0	0	3,040
Louisiana	12,192	41,773	0	53,965	0	235,621	0	235,621				0
Maine	26,536	46,544	0	73,080				0				0
Manzanita Band				0				0				0
Maryland	13,040	100	0	13,140				0				0
Massachusetts	0	0	2,092	2,092				0	0	0	0	0
Michigan	3,050	0	0	3,050				0				0
Minnesota				0				0				0
Mississippi	0	2,886	0	2,886				0	0	82	0	82
Missouri	0	0	1,780	1,780				0				0
Montana			259,353	259,353				0			311,265	311,265
Nebraska	4,010	0	0	4,010				0	0	0	0	0
Nevada				0				0	14,800	1,205	0	16,005
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	7 - Noxious Aquatic Plants				8 - Algal Growth/Chlorophyll a				9 - Flow Alteration			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0				0				0
Alaska				0				0				0
Arizona	4,012	3	0	4,015				0				0
Arkansas				0				0				0
California	43,688	124,865	0	168,553	0	1,800	0	1,800	0	3,711	0	3,711
Colorado				0				0				0
Connecticut				0				0				0
Cortina Rancheria				0				0				0
Delaware				0				0				0
District of Columbia				0				0				0
Florida				0	0	490,496	0	490,496				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	23,340	75,450	0	98,790				0	10	0	0	10
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)	48	7,590	0	7,638				0				0
Kansas	527	2,065	0	2,592				0	396	11,332	0	11,728
Kentucky				0				0			0	0
Louisiana				0				0				0
Maine				0				0	65,067	30	0	65,097
Manzanita Band				0				0				0
Maryland				0				0				0
Massachusetts	0	0	8,706	8,706				0	0	0	460	460
Michigan	6,102	0	0	6,102				0				0
Minnesota				0				0				0
Mississippi				0				0				0
Missouri				0				0				0
Montana			306,116	306,116				0			346,399	346,399
Nebraska	250	0	0	250				0	0	0	0	0
Nevada				0				0				0
New Hampshire	0	74	0	74	0	0	0	0	0	0	0	0

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	10 - Nitrogen				11 - Phosphorus				12 - Pesticides			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0				0	9,250	0	0	9,250
Alaska				0				0				0
Arizona				0				0	386	2	0	388
Arkansas				0				0				0
California				0				0	510	126,886	0	127,396
Colorado				0				0			20	20
Connecticut				0				0				0
Cortina Rancheria				0				0				0
Delaware				0				0				0
District of Columbia				0				0				0
Florida	0	243,840	0	243,840	0	472,896	0	472,896				0
Georgia				0				0	0	0	0	0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois				0				0	13,451	240	0	13,691
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)				0				0	200	337	0	537
Kansas				0				0	16,019	6,191	0	22,210
Kentucky				0				0				0
Louisiana	0	16,832	0	16,832	0	16,832	0	16,832	0	208	0	208
Maine	3,251	53,972	0	57,223				0				0
Manzanita Band				0				0				0
Maryland				0				0	100	0	0	100
Massachusetts				0				0	0	0	171	171
Michigan				0				0	23,635	0	0	23,635
Minnesota				0				0				0
Mississippi				0				0	271	5,332	0	5,603
Missouri				0				0	0	0	27,497	27,497
Montana				0				0				0
Nebraska				0				0	95	16,966	0	17,061
Nevada	0	14,800	0	14,800				0				0
New Hampshire				0				0	0	0	0	0

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	13 - Salinity/TDS/Chlorides				14 - Priority Organic Chemicals				15 - pH			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0	68,698	0	0	68,698	0	1,850	0	1,850
Alaska				0				0				0
Arizona				0				0	13,473	13	0	13,486
Arkansas				0				0				0
California	971	566	0	1,537	0	960	0	960	0	973	0	973
Colorado				0				0			300	300
Connecticut				0	2,875	0	0	2,875				0
Cortina Rancheria				0				0				0
Delaware				0	158	0	0	158				0
District of Columbia				0				0	0	136	0	136
Florida				0				0				0
Georgia				0	0	0	0	0	3,328	700	0	4,028
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois				0	2,041	727	0	2,768	0	282	0	282
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)				0	150	0	0	150				0
Kansas	9,191	9,008	0	18,199				0	50	16,043	0	16,093
Kentucky	0	0	0	0	8,210	0	0	8,210	219	0	0	219
Louisiana				0	60	24	0	84				0
Maine				0				0				0
Manzanita Band				0				0				0
Maryland				0				0	20	0	0	20
Massachusetts				0	0	0	985	985				0
Michigan				0	31,482	0	0	31,482				0
Minnesota				0				0				0
Mississippi				0	46	0	0	46	0	101	0	101
Missouri				0				0				0
Montana			31,347	31,347				0			20	20
Nebraska	0	0	0	0	0	0	0	0	0	0	0	0
Nevada	38,800	0	0	38,800				0				0
New Hampshire	0	0	0	0	0	0	0	0	2,398	2,810	0	5,208

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	16 - Taste and Odor				17 - Pathogens				18 - Turbidity			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0	15,155	0	0	15,155				0
Alaska				0			3,497	3,497				0
Arizona				0	5	1	0	6	6,856	10	0	6,866
Arkansas				0				0				0
California	28	120,338	0	120,366	25,000	0	0	25,000	0	59	0	59
Colorado				0			476	476				0
Connecticut				0				0				0
Cortina Rancheria				0				0				0
Delaware				0	833	150	0	983				0
District of Columbia				0	103	136	0	238				0
Florida				0				0				0
Georgia				0	194	20,083	0	20,277				0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	0	28,567	0	28,567	1,800	1,953	0	3,753				0
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)				0	59	112	0	171	89	7,862	0	7,951
Kansas	20,566		0	20,566	370	208	0	578	50,118	1,045	0	51,163
Kentucky				0				0				0
Louisiana				0	9,248	0	0	9,248	0	51,840	0	51,840
Maine	0	3,845	0	3,845				0	0	7,865	0	7,865
Manzanita Band				0				0				0
Maryland				0	95	0	0	95				0
Massachusetts				0	0	0	0	0	0	0	3,834	3,834
Michigan				0	2,065	0	0	2,065				0
Minnesota				0				0				0
Mississippi				0	0	100	0	100				0
Missouri				0				0				0
Montana				0			13,312	13,312				0
Nebraska	0	0	0	0	0	0	0	0				0
Nevada				0				0				0
New Hampshire	0	0	0	0	0	22	0	22	0	0	0	0

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	19 - Oil and Grease				20 - Lead				Comment
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	
Alabama				0				0	
Alaska				0				0	
Arizona				0	14	1	0	15	
Arkansas				0				0	
California				0				0	
Colorado				0				0	
Connecticut				0				0	Connecticut notes that all 27107.6 assessed lake acres are impaired by mercury and 3203.2 acres are impaired by PCBs due to fish consumption advisories.
Cortina Rancheria				0				0	
Delaware				0				0	
District of Columbia	0	103	0	103				0	
Florida				0				0	
Georgia				0				0	
Guam				0				0	
Hawaii				0				0	
Idaho				0				0	Based on the state’s proposed Section 303(d) list, the major causes of impairment in Idaho’s lakes and reservoirs include oxygen-depleting substances, nutrients, acidity, toxic chemicals, mercury, and flow alterations.
Illinois	200	724	0	924				0	
Indiana				0				0	
Iowa (flood control reservoirs)				0				0	
Iowa (lakes)				0				0	
Kansas				0				0	Kansas notes that taste and odor problems are severe, and the size of lakes with minor taste/odor impairment is unknown.
Kentucky				0				0	Kentucky notes that all impacts in the moderate/minor category are minor.
Louisiana				0	0	104,248	0	104,248	
Maine				0				0	
Manzanita Band				0				0	
Maryland				0				0	
Massachusetts				0				0	
Michigan				0				0	"Mercury lakes" not included in acreage impaired by metals.
Minnesota				0				0	
Mississippi				0				0	
Missouri				0				0	
Montana			9	9				0	
Nebraska	0	0	0	0				0	
Nevada				0				0	
New Hampshire	0	0	0	0	0	0	0	0	Excludes the effects of a statewide fish consumption advisory for mercury.

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	**1 - Nutrients**				**2 - Metals**				**3 - Siltation**			
	Major	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
New Jersey			10,351	10,351				0			10,351	10,351
New Mexico	23,098	11,953	0	35,051	0	63,200	0	63,200	73,594	9,777	0	83,371
New York			152,261	152,261			22,426	22,426			5,612	5,612
North Carolina	115	0	0	115				0	0	115	0	115
North Dakota	95,024	10,954	0	105,978	0	464,319	0	464,319	6,345	85,474	0	91,819
Ohio				0				0				0
Oklahoma	26,799	108,169	0	134,968	5,813	29,542	0	35,355	74,729	135,817	0	210,546
Oregon	0	86,972	0	86,972	0	21,208	0	21,208				0
Pennsylvania				0				0				0
Puerto Rico	0	0	0	0	3,656	0	0	3,656	0	0	0	0
Rhode Island	297	899	0	1,196	484	77	0	561	0	109	0	109
South Carolina				0	11,232	6,458	0	17,690				0
South Dakota	76,342	30,137	0	106,479	65		0	65	76,277	30,096	0	106,373
Tennessee	19,362	11,045	0	30,407	39,000	789	0	39,789	28,384	1,140	0	29,524
Texas				0	227,890	128,200	0	356,090				0
Torres-Martinez Desert Band			9,600	9,600				0				0
Utah	152,726	3,408	0	156,134	0	0	0	0	114,500	4,272	0	118,772
Vermont	2,063	873	0	2,936	3,877	4,310	0	8,187	343	779	0	1,122
Virginia				0	0	0	0	0	0	0	0	0
Washington	0	0	86,201	86,201				0				0
West Virginia	8	2,869	0	2,877	6,372	3,284	0	9,656	2,006	9,962	0	11,968
Wisconsin				0				0				0
Wyoming				0				0				0
Total	670,997	2,070,761	712,603	3,454,361	512,070	1,518,608	80,379	2,111,056	561,974	527,551	83,213	1,172,738

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	4 - Organic Enrichment/Low DO				5 - Mercury				6 - Suspended Solids			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico	32	84	0	116				0				0
New York			5,091	5,091				0				0
North Carolina				0				0				0
North Dakota	9,261	13,221	0	22,482	0	464,319	0	464,319				0
Ohio				0				0				0
Oklahoma	29,300	97,515	0	126,815				0	68,874	80,008	0	148,882
Oregon	0	71,826	0	71,826				0	0	7,846	0	7,846
Pennsylvania				0				0				0
Puerto Rico	9,533	0	0	9,533				0	0	0	0	0
Rhode Island	79	1,302	0	1,381				0	0	26	0	26
South Carolina	98	727	0	825				0				0
South Dakota	46		0	46				0	3,181	14,133	0	17,314
Tennessee	4,637	11,749	0	16,386	39,000	0	0	39,000	480	10,950	0	11,430
Texas	44,149	71,780	0	115,929	10,140	0	0	10,140				0
Torres-Martinez Desert Band			9,600	9,600				0				0
Utah	29,749	34,196	0	63,945	0	0	0	0	1,367	97,385	0	98,752
Vermont	1,087	760	0	1,847	3,793	760	0	4,553				0
Virginia	0	0	0	0				0	0	0	0	0
Washington				0				0				0
West Virginia	3,628	76	0	3,704				0				0
Wisconsin				0				0				0
Wyoming				0				0				0
Total	255,424	567,458	279,053	1,101,936	154,462	723,441	0	877,903	214,859	276,146	311,265	802,270

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	7 - Noxious Aquatic Plants				8 - Algal Growth/Chlorophyll a				9 - Flow Alteration			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico	300	9,404	0	9,704	300	9,404	0	9,704	0	0	0	0
New York				0				0			39,435	39,435
North Carolina	5,151	115	0	5,266				0	160	214	0	374
North Dakota	10	0	0	10				0				0
Ohio				0				0				0
Oklahoma	5,680	12,322	0	18,002				0	40,167	23,483	0	63,650
Oregon	0	9,532	0	9,532	0	11,292	0	11,292	0	808	0	808
Pennsylvania				0				0				0
Puerto Rico	0	0	0	0				0	0	0	0	0
Rhode Island	0	0	0	0	1	1,072	0	1,074				0
South Carolina				0				0				0
South Dakota				0	76,342	30,307	0	106,649	0	15,481	0	15,481
Tennessee	4,550	5	0	4,555				0	494	10,950	0	11,444
Texas				0				0				0
Torres-Martinez Desert Band				0				0				0
Utah	6,498	8,733	0	15,231				0				0
Vermont	165	215	0	380	1,622	279	0	1,901	2,860	457	0	3,317
Virginia				0				0				0
Washington				0				0				0
West Virginia	59	1	0	60	968	2,630	0	3,598				0
Wisconsin				0				0				0
Wyoming				0				0				0
Total	100,380	250,374	314,822	665,575	79,233	547,280	0	626,514	109,154	66,466	386,294	561,914

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	10 - Nitrogen				11 - Phosphorus				12 - Pesticides			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey			10,351	10,351				0				0
New Mexico	27	0	0	27				0	0	1,240	0	1,240
New York				0				0			11,884	11,884
North Carolina				0				0				0
North Dakota				0				0				0
Ohio				0				0				0
Oklahoma				0				0	0	71,204	0	71,204
Oregon				0				0				0
Pennsylvania				0				0				0
Puerto Rico				0				0	0	0	0	0
Rhode Island				0				0				0
South Carolina				0				0				0
South Dakota				0				0				0
Tennessee				0				0				0
Texas				0				0	500	0	0	500
Torres-Martinez Desert Band				0				0			9,600	9,600
Utah				0				0				0
Vermont				0				0				0
Virginia				0				0				0
Washington				0				0				0
West Virginia				0				0				0
Wisconsin				0				0				0
Wyoming				0				0				0
Total	3,278	329,444	10,351	343,073	0	489,728	0	489,728	64,417	228,606	49,172	342,195

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	13 - Salinity/TDS/Chlorides				14 - Priority Organic Chemicals				15 - pH			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico	6,177	0	0	6,177	0	0	0	0	0	107	0	107
New York			36,012	36,012			115,150	115,150			7,301	7,301
North Carolina				0				0				0
North Dakota	0	104	0	104				0				0
Ohio				0				0				0
Oklahoma	29,290	32,080	0	61,370	11,805	0	0	11,805	0	23,163	0	23,163
Oregon				0				0	0	86,104	0	86,104
Pennsylvania				0				0				0
Puerto Rico	0	0	0	0	0	0	0	0	0	0	0	0
Rhode Island	233	183	0	416	0	77	0	77	0	0	0	0
South Carolina				0				0				0
South Dakota	0	0	0	0	65		0	65				0
Tennessee				0	14,600	0	0	14,600	480	11,045	0	11,525
Texas	7,470	0	0	7,470				0				0
Torres-Martinez Desert Band			9,600	9,600				0				0
Utah	80	96,900	0	96,980				0	24,075	3,764	0	27,839
Vermont				0				0	123	1,568	0	1,691
Virginia				0	0	0	0	0	0	0	0	0
Washington				0				0				0
West Virginia	0	2,630	0	2,630				0	1,791	0	0	1,791
Wisconsin				0				0				0
Wyoming				0				0				0
Total	92,212	141,471	76,959	310,642	140,190	1,788	116,135	258,113	45,957	148,659	7,621	202,237

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	16 - Taste and Odor				17 - Pathogens				18 - Turbidity			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico				0	0	0	0	0	0	34	0	34
New York			787	787			19,344	19,344				0
North Carolina				0				0				0
North Dakota				0				0	2,011	1,686	0	3,697
Ohio				0				0				0
Oklahoma	8,430	14,422	0	22,852	0	1,820	0	1,820				0
Oregon				0	0	7,846	0	7,846	0	7,846	0	7,846
Pennsylvania				0				0				0
Puerto Rico	0	0	0	0	3,666	249	0	3,915	0	0	0	0
Rhode Island	0	56	0	56	485	188	0	673	0	262	0	262
South Carolina				0	299	28	0	328				0
South Dakota	0	0	0	0				0	3,181	14,133	0	17,314
Tennessee	0	45	0	45	4,443	1,156	0	5,599				0
Texas				0	9,200	28,625	0	37,825				0
Torres-Martinez Desert Band				0			9,600	9,600				0
Utah				0	0	1,000	0	1,000				0
Vermont				0	0	10	0	10				0
Virginia				0	0	0	0	0				0
Washington				0				0				0
West Virginia				0				0	30	217	0	247
Wisconsin				0				0				0
Wyoming				0				0				0
Total	29,024	167,273	787	197,084	73,020	63,687	46,229	182,937	62,285	92,859	3,834	158,977

Appendix B-4. Leading Pollutants and Stressors Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	19 - Oil and Grease				20 - Lead				Comment
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	
New Jersey				0				0	New Jersey notes that 111 lake acres are threatened by nutrients and siltation. The state also notes that their cause and source assessment is preliminary and these numbers will be updated in the near future.
New Mexico	10	4	0	14				0	
New York				0				0	
North Carolina				0				0	
North Dakota				0				0	
Ohio				0				0	
Oklahoma	11,805	17,609	0	29,414				0	
Oregon				0				0	
Pennsylvania				0				0	
Puerto Rico	0	0	0	0				0	
Rhode Island				0				0	
South Carolina				0				0	
South Dakota	0	0	0	0				0	
Tennessee				0				0	
Texas				0				0	
Torres-Martinez Desert Band				0				0	
Utah	0	98,467	0	98,467	0	0	0	0	
Vermont	0	0	0	0				0	
Virginia				0				0	
Washington				0				0	
West Virginia	0	2,630	0	2,630				0	
Wisconsin				0				0	
Wyoming				0				0	
Total	12,015	119,537	9	131,561	14	104,249	0	104,263	

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	1 - Agriculture				2 - Hydromodification				3 - Urban Runoff/Storm Sewers			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	3,155	200	0	3,355	0	10,250	0	10,250	350	2,110	0	2,460
Alaska				0				0			1,364	1,364
Arizona	15,658	9	0	15,667	15,772	13	0	15,785	535	4	0	539
Arkansas				0				0				0
California	3,000	36,861	0	39,861	121,800	19,123	0	140,923	120,320	9,346	0	129,666
Colorado			615	615				0				0
Connecticut				0	975	0	0	975				0
Cortina Rancheria	0	0	0	0				0	0	0	0	0
Delaware	71	726	0	797				0	186	304	0	490
District of Columbia				0				0	103	136	0	238
Florida	0	564,288	0	564,288	0	57,152	0	57,152	0	222,080	0	222,080
Georgia				0				0	11,334	121,438	0	132,772
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	104,512	27,872	0	132,384	30,172	92,907	0	123,079	7,094	36,761	0	43,855
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)	173	14,324	0	14,497				0	164	1,637	0	1,801
Kansas	38,199	118,931	0	157,130	3,445	17,418	0	20,863	361	7,214	0	7,575
Kentucky	4,710	0	0	4,710				0				0
Louisiana	0	17,040	0	17,040				0	60	0	0	60
Maine	466	34,246	0	34,712	65,067	7,865	0	72,932	13,407	59,954	0	73,361
Manzanita Band				0				0				0
Maryland				0				0	0	100	0	100
Massachusetts	0	0	11	11	0	0	67	67	0	0	10	10
Michigan	48	0	0	48				0				0
Minnesota				0				0				0
Mississippi	0	6,324	0	6,324	0	22	0	22	46	22	0	68
Missouri	0	0	28,035	28,035	0	0	11,780	11,780	0	0	825	825
Montana			370,015	370,015			270,779	270,779				0
Nebraska	508	18,825	0	19,333	0	0	0	0	0	513	0	513
Nevada	0	53,600	0	53,600	0	38,800	0	38,800				0
New Hampshire	0	0	0	0	0	0	0	0	0	68	0	68

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	4 - Municipal Point Sources				5 - Natural Sources				6 - Atmospheric Deposition			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	60	750	0	810	6,025	0	0	6,025				0
Alaska				0				0				0
Arizona	405	4	0	409	25,179	25	0	25,204				0
Arkansas				0				0				0
California				0	12,930	44,878	0	57,808	120,000	4,617	0	124,617
Colorado			20	20				0				0
Connecticut	0	268	0	268				0				0
Cortina Rancheria	0	0	0	0	0	0	0	0				0
Delaware				0	0	491	0	491				0
District of Columbia				0				0				0
Florida	0	187,008	0	187,008				0				0
Georgia	0	0	0	0				0				0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	5,449	46,504	0	51,953	0	5,746	0	5,746	0	4,050	0	4,050
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)	0	193	0	193	0	15,226	0	15,226				0
Kansas	30,180	110,500	0	140,680	18,998	36,256	0	55,254				0
Kentucky	139	0	0	139	1,101	0	0	1,101				0
Louisiana	0	16,832	0	16,832	0	76,397	0	76,397	0	202,861	0	202,861
Maine	0	4,288	0	4,288	23	9,807	0	9,830				0
Manzanita Band				0				0				0
Maryland	0	3	0	3	7,411	0	0	7,411				0
Massachusetts	0	0	86	86	0	0	0	0				0
Michigan	4,185	48	0	4,233				0				0
Minnesota	0	132,583	0	132,583				0				0
Mississippi				0	0	582	0	582				0
Missouri				0				0				0
Montana			132,959	132,959			41,934	41,934			126,007	126,007
Nebraska	0	123	0	123				0				0
Nevada				0	14,800	40,015	0	54,815				0
New Hampshire	0	142	0	142	0	75	0	75	2,342	2,741	0	5,083

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	7 - Range Grazing - Riparian and/or Upland				8 - Nonirrigated Crop Production				9 - Industrial Point Sources			
	Major	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Alabama				0				0	71,678	0	0	71,678
Alaska				0				0				0
Arizona	15,152	6	0	15,158				0	186	1	0	187
Arkansas				0				0				0
California	0	35,036	0	35,036				0	295	0	0	295
Colorado				0				0			20	20
Connecticut				0				0				0
Cortina Rancheria				0				0			0	0
Delaware				0				0				0
District of Columbia				0				0				0
Florida				0				0	0	139,328	0	139,328
Georgia				0				0	650	0	0	650
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois			0	0	104,128	26,338	0	130,466	4,598	8,722	0	13,320
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)				0				0	0	0	0	0
Kansas				0				0				0
Kentucky				0	555	0	0	555	8,210	0	0	8,210
Louisiana				0	0	16,832	0	16,832	60	54,040	0	54,100
Maine				0	36	18,175	0	18,211				0
Manzanita Band				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Michigan				0				0	5,047	0	0	5,047
Minnesota				0				0				0
Mississippi				0	0	3,300	0	3,300	16	0	0	16
Missouri				0	0	0	26,905	26,905				0
Montana			278,751	278,751			14,936	14,936				0
Nebraska				0				0	0	0	0	0
Nevada				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	36	0	36

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	10 - Other				11 - Flow Regulation/Modification				12 - Habitat Modification (other than Hydro)			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	11,080	2,250	0	13,330				0	0	10,250	0	10,250
Alaska			2	2				0				0
Arizona				0	15,772	13	0	15,785				0
Arkansas				0				0				0
California	25	2,601	0	2,626	4,800	10,604	0	15,404	122,280	3,640	0	125,920
Colorado			6,053	6,053				0				0
Connecticut				0				0				0
Cortina Rancheria				0				0				0
Delaware				0				0				0
District of Columbia				0				0				0
Florida	0	53,632	0	53,632				0				0
Georgia	0	55,950	0	55,950				0				0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois				0	0	2,052	0	2,052	28,050	63,475	0	91,525
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)				0				0				0
Kansas				0				0				0
Kentucky	174	0	0	174				0				0
Louisiana	60	279,258	0	279,318				0				0
Maine				0				0				0
Manzanita Band				0				0				0
Maryland	35	0	0	35				0				0
Massachusetts	0	0	0	0				0				0
Michigan				0				0				0
Minnesota				0				0				0
Mississippi	0	582	0	582	0	22	0	22	0	22	0	22
Missouri				0				0				0
Montana				0			270,779	270,779				0
Nebraska	227	6,037	0	6,264				0	0	0	0	0
Nevada				0	0	38,800	0	38,800				0
New Hampshire	0	856	0	856	0	0	0	0	0	0	0	0

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	13 - Irrigated Crop Production				14 - Land Disposal				15 - Pasture Grazing - Riparian and/or Upland			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0				0				0
Alaska				0			3,355	3,355				0
Arizona	386	2	0	388	285	4	0	289	14	1	0	15
Arkansas				0				0				0
California	0	59	0	59	120,160	25,952	0	146,112	3,000	5,395	0	8,395
Colorado				0				0				0
Connecticut				0	33	0	0	33				0
Cortina Rancheria				0				0				0
Delaware				0	0	88	0	88				0
District of Columbia				0				0				0
Florida				0	0	92,864	0	92,864				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois				0	2,958	25,568	0	28,526	303	20,844	0	21,147
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)				0				0				0
Kansas				0				0				0
Kentucky				0	841	317	0	1,158				0
Louisiana	0	17,040	0	17,040				0				0
Maine	0	6,000	0	6,000	400	1,420	0	1,820				0
Manzanita Band				0				0				0
Maryland				0	46	0	0	46				0
Massachusetts				0	0	0	169	169				0
Michigan				0				0	27	0	0	27
Minnesota				0				0				0
Mississippi	0	4,172	0	4,172	0	100	0	100				0
Missouri				0				0				0
Montana			299,364	299,364				0				0
Nebraska				0	0	0	0	0				0
Nevada				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	16 - Resource Extraction				17 - Contaminated Sediments				18 - Construction			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	1,850	1,960	0	3,810	8,000	0	0	8,000	4,480	0	0	4,480
Alaska				0				0				0
Arizona	12,119	3	0	12,122				0				0
Arkansas				0				0				0
California	77,865	30,675	0	108,540	0	431	0	431	120,000	29,042	0	149,042
Colorado			300	300				0				0
Connecticut				0	2,875	0	0	2,875				0
Cortina Rancheria				0	0	0	0	0	0	0	0	0
Delaware				0				0				0
District of Columbia				0				0				0
Florida	0	57,728	0	57,728				0	0	47,168	0	47,168
Georgia				0				0				0
Guam				0				0				0
Hawaii				0				0				0
Idaho				0				0				0
Illinois	82	6,686	0	6,768	53,052	74,751	0	127,803	314	11,763	0	12,077
Indiana				0				0				0
Iowa (flood control reservoirs)				0				0				0
Iowa (lakes)				0				0				0
Kansas	1,390	647	0	2,037				0				0
Kentucky	3,394	0	0	3,394	86	0	0	86				0
Louisiana	0	6,099	0	6,099	60	0	0	60				0
Maine				0				0	32	0	0	32
Manzanita Band				0				0				0
Maryland				0				0				0
Massachusetts				0	0	0	833	833	0	0	0	0
Michigan	2,659	0	0	2,659	8,183	0	0	8,183				0
Minnesota				0				0				0
Mississippi				0				0	0	22	0	22
Missouri				0	0	0	825	825				0
Montana			1,620	1,620			1,520	1,520				0
Nebraska	0	0	0	0				0	513	0	0	513
Nevada	14,800	0	0	14,800				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	19 - Drainage/Filling of Wetlands				20 - Highway Maintenance and Runoff				Comment
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	
Alabama				0				0	"Other" refers to wildlife.
Alaska				0				0	"Other" refers to military sources.
Arizona				0				0	
Arkansas				0				0	
California	120,000	1,840	0	121,840	120,000	25,320	0	145,320	
Colorado				0				0	Colorado did not separate point sources into industrial and municipal. The 20 acres includes both industrial and municipal point source impacts.
Connecticut				0				0	Connecticut notes that all 27107.6 assessed lake acres are impaired by atmospheric deposition due to a statewide fish consumption advisory for mercury.
Cortina Rancheria				0				0	
Delaware				0				0	
District of Columbia				0				0	
Florida				0				0	
Georgia				0				0	Industrial nonpoint sources listed under "other" category. "Unknown sources" are nonpoint only.
Guam				0				0	
Hawaii				0				0	
Idaho				0				0	
Illinois	1,772	4,904	0	6,676	0	14,270	0	14,270	
Indiana				0				0	
Iowa (flood control reservoirs)				0				0	
Iowa (lakes)				0				0	
Kansas				0				0	Natural sources refers mainly to in-lake ecophysiological processes, wind resuspension phenomena, and climate variations.
Kentucky				0				0	
Louisiana				0				0	
Maine				0				0	
Manzanita Band				0				0	
Maryland				0				0	
Massachusetts				0				0	
Michigan				0				0	The acreage listed under "unknown" represents the combined estimated effects from "atmospheric deposition" and "unknown sources."
Minnesota				0				0	
Mississippi	0	22	0	22				0	
Missouri				0				0	
Montana				0			9	9	
Nebraska				0				0	
Nevada				0				0	"Inactive mining" refers to historic mill and mine tailings.
New Hampshire	0	0	0	0				0	Excludes the effects of a statewide fish consumption advisory for mercury. Other = introductions.

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	1 - Agriculture				2 - Hydromodification				3 - Urban Runoff/Storm Sewers			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico	90,509	2,325	0	92,834	0	35	0	35	14	4	0	18
New York			86,534	86,534			42,070	42,070			28,206	28,206
North Carolina	74	0	0	74				0	380	90	0	470
North Dakota	97,072	8,812	0	105,884	10,528	79,640	0	90,168	5,387	1,269	0	6,657
Ohio				0				0				0
Oklahoma	45,698	189,659	0	235,357	46,019	93,553	0	139,572	0	77,574	0	77,574
Oregon	0	98,145	0	98,145				0	0	10,866	0	10,866
Pennsylvania				0				0				0
Puerto Rico	514	524	0	1,038	0	0	0	0	680	208	0	888
Rhode Island	0	608	0	608	43	119		162	303	1,420	0	1,723
South Carolina				0	0	345	0	345	299	11,509	0	11,809
South Dakota	76,310	21,769	0	98,079				0	173		0	173
Tennessee	3,112	799	0	3,911	4,550	10,950	0	15,500	16,594	65	0	16,659
Texas	22,312	22,000	0	44,312	0	260	0	260	500	40,960	0	41,460
Torres-Martinez Desert Band			9,600	9,600				0				0
Utah	43,781	118,489	0	162,270	118,269	5,653	0	123,922	0	110,038	0	110,038
Vermont	1,789	164	0	1,953	3,211	106	0	3,317	5	157	0	162
Virginia	0	0	0	0	0	0	0	0	0	0	0	0
Washington	0	0	11,344	11,344	0	0	586	586	0	0	6,981	6,981
West Virginia	40	3,399	0	3,438				0	39	0	0	39
Wisconsin				0				0				0
Wyoming				0				0				0
Total	551,710	1,359,938	506,154	2,417,801	419,851	434,211	325,282	1,179,344	178,335	715,847	37,386	931,567

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	4 - Municipal Point Sources				5 - Natural Sources				6 - Atmospheric Deposition			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico	0	0	0	0	10,907	450	0	11,357				0
New York			10,103	10,103				0			14,501	14,501
North Carolina				0				0				0
North Dakota	152	247	0	399	74,500	1,913	0	76,413				0
Ohio				0				0				0
Oklahoma				0	12,055	6,579	0	18,634				0
Oregon	0	0	0	0	0	111,231	0	111,231	0	0	0	0
Pennsylvania				0				0				0
Puerto Rico	0	0	0	0	2,116	558	0	2,674	0	0	0	0
Rhode Island	43	0	0	43	0	2	0	2	0	2	0	2
South Carolina	0	1,101	0	1,101				0	0	2,058	0	2,058
South Dakota	0	0	0	0	11,674	5,398	0	17,072				0
Tennessee	4,436	740	0	5,176	4,550	11,010	0	15,560				0
Texas	15,524	47,960	0	63,484	0	33,133	0	33,133	0	128,200	0	128,200
Torres-Martinez Desert Band			9,600	9,600				0				0
Utah	97,073	6,084	0	103,157				0	0	0	0	0
Vermont				0	13	2,037	0	2,050	4,174	5,087	0	9,261
Virginia	0	0	0	0	0	0	0	0				0
Washington	0	0	291	291	0	0	8,726	8,726				0
West Virginia	0	34	0	34	61	0	0	61	43	18	0	61
Wisconsin				0				0				0
Wyoming				0				0				0
Total	157,646	555,412	153,059	866,116	202,343	401,809	50,660	654,812	126,559	349,634	140,508	616,701

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	7 - Range Grazing - Riparian and/or Upland				8 - Nonirrigated Crop Production				9 - Industrial Point Sources			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico				0				0	0	0	0	0
New York				0				0			36,012	36,012
North Carolina				0				0	8,120	0	0	8,120
North Dakota	3,428	18,036	0	21,464	96,320	9,057	0	105,376				0
Ohio				0				0				0
Oklahoma	45,698	178,033	0	223,731	45,698	176,023	0	221,721				0
Oregon				0				0	0	0	0	0
Pennsylvania				0				0				0
Puerto Rico				0				0	317	0	0	317
Rhode Island				0				0	43	0	0	43
South Carolina				0				0	0	12,284	0	12,284
South Dakota				0				0	0	0	0	0
Tennessee				0	1,650	10,950	0	12,600	5,690	0	0	5,690
Texas	22,312	0	0	22,312				0	14,312	9,350	0	23,662
Torres-Martinez Desert Band				0				0			9,600	9,600
Utah				0				0	100,419	12,520	0	112,939
Vermont				0	1,402	760	0	2,162	6	0	0	6
Virginia				0				0	0	0	0	0
Washington				0				0	0	0	0	0
West Virginia				0				0	1,200	0	0	1,200
Wisconsin				0				0				0
Wyoming				0				0				0
Total	86,590	231,111	278,751	596,452	249,789	261,435	41,841	553,064	220,846	236,281	45,632	502,760

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	10 - Other				11 - Flow Regulation/Modification				12 - Habitat Modification (other than Hydro)			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico				0				0	0	35	0	35
New York			11,804	11,804				0			511	511
North Carolina	160	0	0	160				0				0
North Dakota				0				0	10,528	78,258	0	88,786
Ohio				0				0				0
Oklahoma				0	46,019	27,433	0	73,452	12,236	41,145	0	53,381
Oregon				0				0				0
Pennsylvania				0				0				0
Puerto Rico				0				0	0	0	0	0
Rhode Island	1	0	0	1	43	119	0	162				0
South Carolina	3,434	383	0	3,817				0				0
South Dakota				0				0	1,339	15,481	0	16,820
Tennessee				0	4,550	10,950	0	15,500	0	10,950	0	10,950
Texas				0				0				0
Torres-Martinez Desert Band				0				0				0
Utah				0				0	7,305	10,946	0	18,251
Vermont				0	3,211	106	0	3,317	132	1,031	0	1,163
Virginia	0	0	0	0				0	0	0	0	0
Washington	0	0	2,618	2,618				0				0
West Virginia				0				0	48	0	0	48
Wisconsin				0				0				0
Wyoming				0				0				0
Total	15,197	401,548	20,477	437,222	74,395	90,099	270,779	435,273	181,918	235,233	511	417,662

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	13 - Irrigated Crop Production				14 - Land Disposal				15 - Pasture Grazing - Riparian and/or Upland			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico				0	327	13	0	340				0
New York				0			34,000	34,000				0
North Carolina				0				0				0
North Dakota	32	0	0	32				0	37	90,855	0	90,892
Ohio				0				0				0
Oklahoma	32,300	50,764	0	83,064	0	2,609	0	2,609	45,698	176,623	0	222,321
Oregon				0	0	13,129	0	13,129				0
Pennsylvania				0				0				0
Puerto Rico				0	4,243	432	0	4,675				0
Rhode Island	0	85	0	85	0	208	0	208	0	42	0	42
South Carolina				0				0				0
South Dakota				0	10,873	9,768	0	20,641				0
Tennessee				0				0				0
Texas				0	14,312	7,000	0	21,312				0
Torres-Martinez Desert Band				0				0				0
Utah				0	0	390	0	390				0
Vermont				0	0	10	0	10	1,412	760	0	2,172
Virginia				0	0	0	0	0				0
Washington				0	0	0	6,399	6,399				0
West Virginia				0	0	2,801	0	2,801				0
Wisconsin				0				0				0
Wyoming				0				0				0
Total	32,718	78,122	299,364	410,204	154,478	182,673	43,923	381,073	50,491	294,520	0	345,011

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	16 - Resource Extraction				17 - Contaminated Sediments				18 - Construction			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
New Jersey				0				0				0
New Mexico	1,342	0	0	1,342				0	0	0	0	0
New York				0			31,439	31,439			1,169	1,169
North Carolina				0				0	0	0	0	0
North Dakota	0	261	0	261				0	0	1,619	0	1,619
Ohio				0				0				0
Oklahoma	29,290	79,951	0	109,241	17,628	19,022	0	36,650	0	26,456	0	26,456
Oregon	0	895	0	895				0				0
Pennsylvania				0				0				0
Puerto Rico	0	0	0	0	0	0	0	0	0	0	0	0
Rhode Island				0	0	77	0	77	0	5	0	5
South Carolina				0				0				0
South Dakota				0				0				0
Tennessee	974	468	0	1,442	81,248	15,474	0	96,722	0	10,965	0	10,965
Texas				0				0				0
Torres-Martinez Desert Band				0				0				0
Utah	0	173	0	173	0	0	0	0	173	7,144	0	7,317
Vermont				0				0	3	938	0	941
Virginia	0	0	0	0				0				0
Washington	0	0	0	0				0	0	0	1,745	1,745
West Virginia	3,924	6,745	0	10,669				0	139	8	0	147
Wisconsin				0				0				0
Wyoming				0				0				0
Total	149,689	192,291	1,920	343,899	171,132	109,755	34,617	315,504	125,654	135,130	2,914	263,697

Appendix B-5. Leading Sources Impairing Assessed Lakes, Reservoirs, and Ponds

Jurisdiction	19 - Drainage/Filling of Wetlands				20 - Highway Maintenance and Runoff				Comment
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	
New Jersey				0				0	New Jersey notes that their cause and source assessment is preliminary and these numbers will be updated in the near future.
New Mexico				0	0	60	0	60	
New York				0				0	
North Carolina				0				0	"Other" refers to a dam breached by Hurricane Fran.
North Dakota	5,510	77,644	0	83,154				0	
Ohio				0				0	
Oklahoma				0	38,230	25,315	0	63,545	
Oregon				0				0	
Pennsylvania				0				0	
Puerto Rico				0				0	
Rhode Island				0				0	
South Carolina				0				0	
South Dakota				0				0	
Tennessee	0	10,950	0	10,950				0	
Texas				0				0	
Torres-Martinez Desert Band				0				0	
Utah	7,305	10,946	0	18,251				0	Utah notes that "filling and draining" is the draining and filling of reservoirs that are considered a type of wetlands.
Vermont				0	30	245	0	275	
Virginia				0				0	
Washington				0				0	
West Virginia				0	0	48	0	48	
Wisconsin				0				0	
Wyoming				0				0	
Total	134,587	106,306	0	240,893	158,260	65,258	9	223,527	

Appendix C-1. Total Estuarine and Ocean Shoreline Waters in the Nation

	Estuaries			Ocean Shoreline Waters			
Jurisdiction	Total Sq. Miles	Assessed Sq. Miles	Percent Assessed	Total Miles	Assessed Miles	Percent Assessed	Comment
Alabama	610.0	610.0	100%	337	50	15%	
Alaska	33,256.7	236.7	1%	44,226	4	0%	
California	1,007.8	900.0	89%	1,609	919	57%	Estuarine waters include bays and harbors.
Connecticut	612.5	612.5	100%	380	0	0%	
Delaware	811.5	29.5	4%	25	25	100%	
Delaware River	866.0	866.0	100%				The Delaware River Basin Commission includes 25 sq. mi. of tidal freshwater in their estimate of 866 estuarine sq. mi.
District of Columbia	6.1	5.9	97%				
Florida	4,298.0	1,419.0	33%	8,460	0	0%	
Georgia	854.0	854.0	100%	100	0	0%	
Guam	1.4	0.0	0%	117	14	12%	
Hawaii	54.8	54.8	100%	1,052	884	84%	
Interstate Sanitation Commission	991.9	991.9	100%				The estuarine square mileage presented here is an estimate. The ISC is working to refine it for future 305(b) reports.
Louisiana	7,656.0	3,043.5	40%	397	0	0%	
Maine	2,851.6	2,851.6	100%	5,249		0%	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland	2,522.4	2,465.7	98%	32	32	100%	
Massachusetts	2,727.5	217.4	8%	1,519	0	0%	Massachusetts reports on "marine waters," which include harbors, bays, estuaries, and open ocean waters. However, open ocean waters are generally excluded from assessments.
Mississippi	760.0	211.8	28%	245	134	55%	
N Mariana Islands	15,975.4	0.0	0%	52	1	2%	These values are for Saipan only. They do not include the other 16 islands of the Commonwealth.
New Hampshire	28.2	28.2	100%	18	18	100%	
New Jersey	614.0	614.0	100%	127	127	100%	
New York	1,530.0	1,530.0	100%	120	120	100%	
North Carolina	3,122.0	3,122.0	100%	320	0	0%	
Oregon	206.0	53.7	26%	362	0	0%	
Puerto Rico				550	550	100%	Puerto Rico assessed estuarine use support in linear miles rather than square miles.
Rhode Island	152.0	151.6	100%	79	79	100%	
South Carolina	682.0	221.1	32%	190	0	0%	
Texas	1,991.6	1,991.6	100%	624			Texas assessed coastal waters in square miles rather than coastal miles.
Virgin Islands	920.5	727.2	79%	173	173	100%	
Virginia	2,451.0	2,418.1	99%	120	0	0%	
Washington	2,903.9	2,459.5	85%	163	0	0%	
Total	90,464.7	28,687.2		66,645	3,130		
		32%			5%		

Appendix C-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Estuaries

Jurisdiction	Full Support - Evaluated	Full Support - Monitored	Full Support - Not Specified	Full Support - Total	Threatened - Evaluated	Threatened - Monitored	Threatened - Not Specified	Threatened - Total	Impaired - Evaluated	Impaired - Monitored	Impaired - Not Specified	Impaired - Total
Alabama	0.0	192.0	0.0	192.0	0.0	0.0	0.0	0.0	0.0	418.0	0.0	418.0
Alaska	0.1	1.9	0.0	2.0				0.0	211.4	23.3	0.0	234.7
California	19.5	217.0	0.0	236.5	18.9	2.8	0.0	21.7	36.4	605.4	0.0	641.8
Connecticut	25.9	124.0	0.0	149.9	0.0	0.0	0.0	0.0	58.5	404.1	0.0	462.6
Delaware	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.5	0.0	29.5
Delaware River	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	866.0	0.0	0.0	866.0
District of Columbia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	5.9
Florida	0.0	873.8	0.0	873.8	0.0	0.0	0.0	0.0	0.0	545.2	0.0	545.2
Georgia	445.0	10.0	0.0	455.0				0.0	177.0	222.0	0.0	399.0
Guam				0.0				0.0				0.0
Hawaii	0.0	23.7	0.0	23.8	0.0	0.4	0.0	0.4	0.9	29.7	0.0	30.6
Interstate Sanitation Commission			466.2	466.2			0.0	0.0			525.7	525.7
Louisiana	1.5	22.0	0.0	23.5	287.0	0.0	0.0	287.0	1,872.0	861.0	0.0	2,733.0
Maine	0.0	2,473.4	0.0	2,473.4	0.0	0.0	0.0	0.0	0.0	378.2	0.0	378.2
Maryland	0.0	1,243.3	0.0	1,243.3				0.0	0.0	1,222.4	0.0	1,222.4
Massachusetts	70.3	0.0	0.0	70.3	0.0	0.0	0.0	0.0	139.7	7.3	0.0	147.1
Mississippi	0.0	17.6	0.0	17.6	0.8	136.6	0.0	137.4	0.6	56.2	0.0	56.8
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0				0.0	0.0	28.2	0.0	28.2
New Jersey	0.0	0.0	0.0	0.0	0.0	458.0	0.0	458.0	0.0	156.0	0.0	156.0
New York			1,120.0	1,120.0			0.6	0.6			409.6	409.6
North Carolina			2,693.0	2,693.0			246.0	246.0			183.0	183.0
Oregon	0.0	7.5	0.0	7.5	0.0	11.2	0.0	11.2	0.0	35.0	0.0	35.0
Puerto Rico				0.0				0.0				0.0
Rhode Island	0.4	1.0	0.0	1.4	0.3	45.7	0.0	46.1	5.1	99.1	0.0	104.1
South Carolina	0.0	137.6	0.0	137.6				0.0	0.0	83.5	0.0	83.5
Texas	0.0	1,243.1	0.0	1,243.1	0.0	0.0	0.0	0.0	0.0	748.5	0.0	748.5
Virgin Islands	527.9	0.0	0.0	527.9	198.4	0.0	0.0	198.4	0.0	0.9	0.0	0.9
Virginia	39.3	583.2	0.0	622.5	0.1	1,358.7	0.0	1,358.8	1.8	435.0	0.0	436.8
Washington	0.0	859.2	0.0	859.2				0.0	0.0	1,600.3	0.0	1,600.3
Total	1,129.9	8,030.3	4,279.2	13,439.4	505.6	2,013.4	246.6	2,765.6	3,369.4	7,994.8	1,118.3	12,482.4
	4%	28%	15%	47%	2%	7%	1%	10%	12%	28%	4%	44%

Appendix C-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Estuaries

Jurisdiction	Not Attainable - Evaluated	Not Attainable - Monitored	Not Attainable - Not Specified	Not Attainable - Total	Total Evaluated	Total Monitored	Total Unspecified	Total Assessed	Comment
Alabama				0.0	0.0	610.0	0.0	610.0	
Alaska				0.0	211.5	25.2	0.0	236.7	State reported overall use support status. Alaska's assessment data is biased towards those waters with known impairment; efforts are underway to assess other waters across the state.
California				0.0	74.8	825.2	0.0	900.0	
Connecticut	0.0	0.0	0.0	0.0	84.4	528.0	0.0	612.5	State reported overall use support status. Excludes the effect of a statewide fish consumption advisory for PCBs. The advisory is specific to striped bass and bluefish.
Delaware				0.0	0.0	29.5	0.0	29.5	
Delaware River				0.0	866.0	0.0	0.0	866.0	
District of Columbia				0.0	0.0	5.9	0.0	5.9	
Florida				0.0	0.0	1,419.0	0.0	1,419.0	State reported overall use support status.
Georgia				0.0	622.0	232.0	0.0	854.0	
Guam				0.0	0.0	0.0	0.0	0.0	
Hawaii				0.0	0.9	53.8	0.0	54.8	
Interstate Sanitation Commission				0.0	0.0	0.0	991.9	991.9	Entered fish consumption use support data in lieu of summary use support data.
Louisiana				0.0	2,160.5	883.0	0.0	3,043.5	
Maine				0.0	0.0	2,851.6	0.0	2,851.6	Excludes the effect of a statewide consumption advisory for lobster tomalley due to dioxin and PCB contamination.
Maryland				0.0	0.0	2,465.7	0.0	2,465.7	
Massachusetts				0.0	210.0	7.3	0.0	217.4	
Mississippi	0.0	0.0	0.0	0.0	1.4	210.4	0.0	211.8	
N Mariana Islands				0.0	0.0	0.0	0.0	0.0	
New Hampshire	0.0	0.0	0.0	0.0	0.0	28.2	0.0	28.2	
New Jersey				0.0	0.0	614.0	0.0	614.0	Entered shellfishing use support data in lieu of summary use support data.
New York				0.0	0.0	0.0	1,530.2	1,530.2	
North Carolina				0.0	0.0	0.0	3,122.0	3,122.0	
Oregon				0.0	0.0	53.7	0.0	53.7	
Puerto Rico				0.0	0.0	0.0	0.0	0.0	Puerto Rico reported linear miles of estuarine use support rather than square miles. Of the 175.4 miles assessed, 15.2% fully support all uses, 84% are threatened for one or more uses, and 0.8% are impaired for one or more uses.
Rhode Island	0.0	0.0	0.0	0.0	5.8	145.8	0.0	151.6	
South Carolina				0.0	0.0	221.1	0.0	221.1	South Carolina included the effects of a statewide fish consumption advisory for mercury in those basins assessed during 1996 and 1997, but did not for those basins assessed previously.
Texas	0.0	0.0	0.0	0.0	0.0	1,991.6	0.0	1,991.6	
Virgin Islands				0.0	726.3	0.9	0.0	727.2	State reported overall use support status.
Virginia				0.0	41.3	2,376.9	0.0	2,418.1	
Washington				0.0	0.0	2,459.5	0.0	2,459.5	State reported overall use support status.
Total	0.0	0.0	0.0	0.0	5,004.8	18,038.5	5,644.1	28,687.4	
	0%	0%	0%	0%	17%	63%	20%		

Appendix C-3a. Aquatic Life Use Support in Assessed Estuaries

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	610.0	0.0	0.0	0.0	0.0	610.0	
Alaska						0.0	
California	236.3	3.3	583.3	47.0		869.9	
Connecticut	368.0	0.0	185.2	59.3	0.0	612.5	
Delaware	0.0		0.0	29.0		29.0	
Delaware River	36.0	96.0	49.0	35.0		216.0	
District of Columbia	3.5	0.0	2.5	0.0		5.9	
Florida	268.5	0.0	273.1	59.5		601.1	
Georgia	753.0		99.0	2.0		854.0	
Guam						0.0	
Hawaii	0.0	0.0	0.0	0.0	0.0	0.0	
Interstate Sanitation Commission	69.0	33.3	10.7	6.0	0.0	119.0	
Louisiana	321.5	0.0	2,555.0	92.0		2,968.5	
Maine	2,851.1	0.0	0.5	0.0		2,851.6	
Maryland	1,357.3		1,100.0	2.1		2,459.4	
Massachusetts	62.9	1.0	22.4	48.3	0.0	134.5	
Mississippi	20.7	158.4	20.3	0.0	0.0	199.4	
N Mariana Islands						0.0	
New Hampshire	27.8		0.4	0.0	0.0	28.2	
New Jersey						0.0	
New York	1,515.1	0.3	14.2	0.4		1,530.0	
North Carolina						0.0	
Oregon						0.0	
Puerto Rico						0.0	Puerto Rico reported linear miles of estuarine use support rather than square miles.
Rhode Island	99.4	26.9	14.3	11.0		151.5	
South Carolina	151.2		35.9	34.0		221.1	
Texas	1,769.8	0.0	126.5	17.6	0.0	1,913.9	
Virgin Islands	527.9	198.4	0.9	0.0		727.2	
Virginia	173.0	1,965.0	237.0	65.0		2,440.0	
Washington	963.2		1,236.3	704.3		2,903.8	
Total	12,185.2	2,482.6	6,566.4	1,212.4	0.0	22,446.5	
	54%	11%	29%	5%	0%		

Appendix C-3b. Fish Consumption Use Support in Assessed Estuaries

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	610.0	0.0	0.0	0.0	0.0	610.0	
Alaska						0.0	
California	263.7	20.9	571.5	23.9		879.9	
Connecticut	612.5	0.0	0.0	0.0	0.0	612.5	Excludes the effect of a statewide fish consumption advisory for PCBs. The advisory is specific to striped bass and bluefish.
Delaware						0.0	
Delaware River	0.0	0.0	803.0	63.0		866.0	
District of Columbia	0.0	0.0	0.0	5.9		5.9	
Florida	0.0	0.0	319.3	0.0		319.3	
Georgia	833.0		0.0	21.0		854.0	
Guam						0.0	
Hawaii	0.0	0.0	0.0	0.0	0.0	0.0	
Interstate Sanitation Commission	466.2	0.0	495.9	29.8	0.0	991.9	
Louisiana						0.0	
Maine	0.0	0.0	2,851.6	0.0		2,851.6	
Maryland	2,445.4		19.9	0.0		2,465.3	
Massachusetts	0.0	0.0	0.0	45.5	0.0	45.5	
Mississippi	21.4	28.5	0.0	0.0	0.0	49.9	
N Mariana Islands						0.0	
New Hampshire	0.0		28.2	0.0	0.0	28.2	
New Jersey						0.0	
New York	1,413.2	0.0	116.8	0.0		1,530.0	
North Carolina						0.0	
Oregon						0.0	
Puerto Rico						0.0	Category not applicable.
Rhode Island						0.0	
South Carolina						0.0	
Texas	610.7	0.0	0.0	37.1	0.0	647.8	
Virgin Islands	50.6	0.0	0.0	0.0		50.6	
Virginia	2,213.0	239.0	0.0	0.0		2,452.0	
Washington						0.0	
Total	9,539.6	288.4	5,206.3	226.1	0.0	15,260.4	
	63%	2%	34%	1%	0%		

Appendix C-3c. Shellfishing Use Support in Assessed Estuaries

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	79.0	0.0	418.0	0.0	0.0	497.0	
Alaska						0.0	
California	267.1	20.6	452.0	9.1		748.8	
Connecticut	287.3	0.0	0.0	319.3	0.0	606.6	
Delaware	0.6		29.0	0.0		29.5	
Delaware River	582.0	0.0	35.0	62.0		679.0	
District of Columbia						0.0	
Florida	605.3	0.0	212.6	0.0		817.9	
Georgia	455.0		0.0	395.0		850.0	
Guam						0.0	
Hawaii	0.0	0.0	0.0	0.0	0.0	0.0	
Interstate Sanitation Commission	416.6	0.0	277.7	297.6	0.0	991.9	
Louisiana	316.0	0.0	67.0	75.0		458.0	
Maine	2,473.4	0.0	49.1	329.1		2,851.6	
Maryland	1,687.6		71.2	79.7		1,838.5	
Massachusetts						0.0	
Mississippi	14.6	2.3	26.2	0.0	0.0	43.1	
N Mariana Islands						0.0	
New Hampshire	0.0		11.9	16.3	0.0	28.2	
New Jersey	0.0	458.0	113.0	43.0		614.0	
New York	1,367.0	0.0	6.1	156.9		1,530.0	
North Carolina						0.0	
Oregon	3.7	0.0	51.8	0.0		55.5	
Puerto Rico	0.0	0.0	0.0	0.0	0.0	0.0	
Rhode Island	91.5	7.2	20.5	5.5		124.8	
South Carolina	620.7		153.9	112.4		886.9	
Texas	1,165.5	0.0	430.9	303.6	0.0	1,900.0	
Virgin Islands						0.0	Category not applicable.
Virginia	2,073.0	3.0	116.0	24.0		2,216.0	
Washington	285.2		82.7	76.5		444.4	
Total	12,791.1	491.1	2,624.5	2,304.9	0.0	18,211.7	
	70%	3%	14%	13%	0%		

Appendix C-3d. Swimming Use Support in Assessed Estuaries

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	583.0	0.0	0.0	0.0	0.0	583.0	
Alaska						0.0	
California	270.4	2.8	507.0	4.6		784.7	
Connecticut	592.3	0.0	6.2	14.0	0.0	612.5	
Delaware	12.0		13.0	4.5		29.5	
Delaware River	193.0	8.0	0.0	0.0		201.0	
District of Columbia	0.0	0.0	0.0	5.9		5.9	
Florida	268.5	0.0	273.1	59.5		601.1	
Georgia	850.0		4.0	0.0		854.0	
Guam						0.0	
Hawaii	0.0	0.0	0.0	0.0	0.0	0.0	
Interstate Sanitation Commission	843.1	9.9	0.0	138.9	0.0	991.9	
Louisiana	588.5	385.0	9.0	623.0		1,605.5	
Maine	2,847.7	0.0	3.9	0.0		2,851.6	
Maryland	2,462.5		0.3	2.5		2,465.3	
Massachusetts	92.6	0.0	76.0	13.5	0.0	182.1	
Mississippi	219.2	94.8	25.1	0.0	0.0	339.1	
N Mariana Islands						0.0	
New Hampshire	28.2		0.0	0.0	0.0	28.2	
New Jersey	0.1		0.0	0.0		0.1	
New York	1,430.3	0.0	94.7	5.0		1,530.0	
North Carolina						0.0	
Oregon	24.9	0.0	0.0	0.0		24.9	
Puerto Rico						0.0	Puerto Rico reported linear miles of estuarine use support rather than square miles.
Rhode Island	116.3	21.9	11.3	2.2		151.6	
South Carolina	197.2		11.5	12.5		221.1	
Texas	1,924.6	0.0	1.8	5.3	0.0	1,931.7	
Virgin Islands	5.7	0.0	0.0	0.0		5.7	
Virginia	2,281.0	9.0	16.0	3.0		2,309.0	
Washington	2,875.0		14.4	14.7		2,904.1	
Total	18,705.9	531.4	1,067.2	909.1	0.0	21,213.6	
	88%	3%	5%	4%	0%		

Appendix C-3e. Secondary Contact Use Support in Assessed Estuaries

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	610.0	0.0	0.0	0.0	0.0	610.0	
Alaska						0.0	
California	278.5	2.7	576.1	3.7		860.9	
Connecticut						0.0	
Delaware	29.0		0.0	0.0		29.0	
Delaware River	206.0	8.0	0.0	0.0		214.0	
District of Columbia	0.0	0.0	5.1	0.8		5.9	
Florida	268.5	0.0	273.1	59.5		601.1	
Georgia	854.0		0.0	0.0		854.0	
Guam						0.0	
Hawaii	0.0	0.0	0.0	0.0	0.0	0.0	
Interstate Sanitation Commission	991.9	0.0	0.0	0.0	0.0	991.9	
Louisiana	590.5	385.0	630.0	0.0		1,605.5	
Maine						0.0	
Maryland						0.0	
Massachusetts	163.0	0.4	9.2	9.5	0.0	182.1	
Mississippi	0.0	1.0	10.3	0.0	0.0	11.3	
N Mariana Islands						0.0	
New Hampshire	28.2		0.0	0.0	0.0	28.2	
New Jersey						0.0	
New York	1,514.2	0.2	15.6	0.0		1,530.0	
North Carolina						0.0	
Oregon	24.9	0.0	0.0	0.0		24.9	
Puerto Rico						0.0	Puerto Rico reported linear miles of estuarine use support rather than square miles.
Rhode Island						0.0	
South Carolina						0.0	
Texas						0.0	
Virgin Islands	50.6	0.0	0.0	0.0		50.6	
Virginia						0.0	
Washington	2,869.1		23.2	11.6		2,903.9	
Total	8,478.3	397.3	1,542.6	85.1	0.0	10,503.3	
	81%	4%	15%	1%	0%		

Appendix C-4. Leading Pollutants and Stressors Impairing Assessed Estuaries

Jurisdiction	1 - Pathogens				2 - Organic Enrichment/Low DO				3 - Metals			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	418.0	0.0	0.0	418.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska				0.0			12.0	12.0			2.3	2.3
California	8.3	15.5	0.0	23.9	0.2	3.4	0.0	3.6	114.4	460.2	0.0	574.5
Connecticut	316.8	13.9	0.0	330.7	50.2	173.2	0.0	223.4	0.3	6.3	0.0	6.6
Delaware	10.2	12.0	0.0	22.2	22.2	3.0	0.0	25.2				0.0
Delaware River	0.0	97.0	0.0	97.0	0.0	49.0	0.0	49.0	0.0	14.0	0.0	14.0
District of Columbia	0.8	5.1	0.0	5.9	0.3	0.5	0.0	0.8				0.0
Florida				0.0				0.0	0.0	77.6	0.0	77.6
Georgia	302.0	97.0	0.0	399.0	0.0	95.0	0.0	95.0	0.0	2.0	0.0	2.0
Guam				0.0				0.0				0.0
Hawaii	0.0	15.7	0.0	15.7	0.0	1.7	0.0	1.7	0.0	4.5	0.0	4.5
Interstate Sanitation Commission			949.6	949.6			9.1	9.1				0.0
Louisiana	75.0	1,084.0	0.0	1,159.0	0.0	712.0	0.0	712.0	0.0	2,580.0	0.0	2,580.0
Maine	329.1	49.1	0.0	378.2	1.4	0.0	0.0	1.4				0.0
Maryland	151.4	0.0	0.0	151.4	1,066.3	0.0	0.0	1,066.3	0.0	42.5	0.0	42.5
Massachusetts	0.0	0.0	142.9	142.9	0.0	0.0	39.6	39.6	0.0	0.0	35.8	35.8
Mississippi	0.0	36.5	0.0	36.5	0.0	27.7	0.0	27.7	0.0	29.7	0.0	29.7
N Mariana Islands				0.0				0.0				0.0
New Hampshire	16.3	0.5	0.0	16.8	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.4
New Jersey			156.0	156.0				0.0				0.0
New York			262.8	262.8			14.9	14.9				0.0
North Carolina	54.0	0.0	0.0	54.0	28.0	0.0	0.0	28.0				0.0
Oregon	0.0	26.4	0.0	26.4				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island	22.6	22.0		44.6	10.7	12.9	0.0	23.6	0.0	9.3	0.0	9.3
South Carolina	12.5	11.5	0.0	24.0	19.5	35.9	0.0	55.5	14.5	0.0	0.0	14.5
Texas	229.4	397.6	0.0	627.0	0.0	127.2	0.0	127.2	29.8	8.0	0.0	37.8
Virgin Islands	0.0	0.0	0.2	0.2	0.0	0.0	0.9	0.9				0.0
Virginia	33.8	124.5	0.0	158.3	64.5	218.4	0.0	282.9	0.0	0.1	0.0	0.1
Washington	0.0	0.0	418.6	418.6	0.0	0.0	2,384.8	2,384.8				0.0
Total	1,980.2	2,008.4	1,930.1	5,918.7	1,263.3	1,460.0	2,461.3	5,184.6	159.0	3,234.5	38.0	3,431.5

Appendix C-4. Leading Pollutants and Stressors Impairing Assessed Estuaries

	4 - Nutrients				5 - Mercury				6 - Thermal Modifications			
Jurisdiction	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0.0	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0
Alaska			4.9	4.9				0.0				0.0
California	2.6	21.9	0.0	24.5	75.0	418.6	0.0	493.6	0.0	10.4	0.0	10.5
Connecticut	217.7	13.9	0.0	231.5				0.0				0.0
Delaware	22.2	3.0	0.0	25.2				0.0				0.0
Delaware River				0.0	0.0	14.0	0.0	14.0				0.0
District of Columbia				0.0				0.0				0.0
Florida	0.0	487.7	0.0	487.7				0.0				0.0
Georgia				0.0				0.0				0.0
Guam				0.0				0.0				0.0
Hawaii	0.6	27.0	0.0	27.6				0.0	0.0	0.4	0.0	0.4
Interstate Sanitation Commission				0.0				0.0				0.0
Louisiana	0.0	964.0	0.0	964.0	0.0	2,290.0	0.0	2,290.0				0.0
Maine				0.0				0.0				0.0
Maryland	0.0	1,071.2	0.0	1,071.2				0.0				0.0
Massachusetts	0.0	0.0	16.7	16.7				0.0				0.0
Mississippi	0.0	22.6	0.0	22.6				0.0	0.0	2.2	0.0	2.2
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York				0.0				0.0				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island	0.0	4.2	0.0	4.2				0.0	8.9	0.0	0.0	8.9
South Carolina				0.0				0.0				0.0
Texas				0.0	24.0	8.0	0.0	32.0				0.0
Virgin Islands				0.0				0.0				0.0
Virginia				0.0				0.0	0.0	0.0	0.0	0.0
Washington				0.0				0.0	0.0	0.0	2,199.9	2,199.9
Total	243.0	2,615.4	21.6	2,880.0	99.0	2,730.6	0.0	2,829.6	8.9	13.0	2,199.9	2,221.8

Appendix C-4. Leading Pollutants and Stressors Impairing Assessed Estuaries

Jurisdiction	7 - Phosphorus				8 - PCBs				9 - Copper			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0.0				0.0				0.0
Alaska			4.9	4.9				0.0				0.0
California				0.0	1.1	418.6	0.0	419.7	0.0	238.9	0.0	238.9
Connecticut				0.0				0.0				0.0
Delaware				0.0				0.0				0.0
Delaware River				0.0	866.0	0.0	0.0	866.0				0.0
District of Columbia				0.0				0.0				0.0
Florida	0.0	396.1	0.0	396.1				0.0	0.0	20.1	0.0	20.1
Georgia				0.0				0.0				0.0
Guam				0.0				0.0				0.0
Hawaii				0.0				0.0				0.0
Interstate Sanitation Commission				0.0				0.0				0.0
Louisiana	0.0	964.0	0.0	964.0				0.0	0.0	856.0	0.0	856.0
Maine				0.0				0.0				0.0
Maryland				0.0				0.0				0.0
Massachusetts				0.0				0.0				0.0
Mississippi				0.0				0.0				0.0
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	28.2	0.0	28.2	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York				0.0				0.0				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island				0.0	0.0	1.0	0.0	1.0				0.0
South Carolina				0.0				0.0				0.0
Texas				0.0				0.0	8.0	8.0	0.0	16.0
Virgin Islands				0.0				0.0				0.0
Virginia				0.0	0.0	0.0	0.0	0.0				0.0
Washington				0.0				0.0				0.0
Total	0.0	1,360.1	4.9	1,365.0	867.1	447.8	0.0	1,314.9	8.0	1,123.0	0.0	1,131.0

Appendix C-4. Leading Pollutants and Stressors Impairing Assessed Estuaries

Jurisdiction	10 - Nitrogen				11 - Priority Organic Chemicals				12 - Pesticides			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska				0.0				0.0				0.0
California				0.0	1.3	479.7	0.0	481.0	16.4	344.1	0.0	360.5
Connecticut				0.0	0.4	12.9	0.0	13.4				0.0
Delaware				0.0				0.0				0.0
Delaware River				0.0	6.0	2.0	0.0	8.0	25.0	0.0	0.0	25.0
District of Columbia				0.0	0.0	0.8	0.0	0.8	0.0	0.8	0.0	0.8
Florida	0.0	146.6	0.0	146.6				0.0				0.0
Georgia				0.0	0.0	2.0	0.0	2.0				0.0
Guam				0.0				0.0				0.0
Hawaii				0.0				0.0	0.0	1.4	0.0	1.4
Interstate Sanitation Commission				0.0			47.6	47.6				0.0
Louisiana	0.0	964.0	0.0	964.0				0.0				0.0
Maine				0.0				0.0				0.0
Maryland				0.0	0.0	38.5	0.0	38.5	19.9	0.0	0.0	19.9
Massachusetts				0.0	0.0	0.0	41.0	41.0				0.0
Mississippi				0.0	0.0	10.9	0.0	10.9				0.0
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York				0.0			127.3	127.3				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island				0.0				0.0				0.0
South Carolina				0.0	0.2	0.0	0.0	0.2	0.2	0.0	0.0	0.2
Texas				0.0	22.0	0.0	0.0	22.0				0.0
Virgin Islands				0.0				0.0				0.0
Virginia				0.0	0.0	13.2	0.0	13.2				0.0
Washington				0.0				0.0				0.0
Total	0.0	1,110.6	0.0	1,110.6	29.9	560.0	215.8	805.8	61.5	346.3	0.0	407.8

Appendix C-4. Leading Pollutants and Stressors Impairing Assessed Estuaries

Jurisdiction	13 - Selenium				14 - pH				15 - Other Habitat Alterations			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska				0.0				0.0				0.0
California	0.0	396.1	0.0	396.1	0.0	0.0	0.0	0.0	19.3	224.8	0.0	244.1
Connecticut				0.0				0.0				0.0
Delaware				0.0				0.0				0.0
Delaware River				0.0				0.0				0.0
District of Columbia				0.0	0.0	5.1	0.0	5.1				0.0
Florida	0.0	3.1	0.0	3.1				0.0				0.0
Georgia				0.0				0.0				0.0
Guam				0.0				0.0				0.0
Hawaii				0.0				0.0				0.0
Interstate Sanitation Commission				0.0				0.0				0.0
Louisiana				0.0				0.0	0.0	91.0	0.0	91.0
Maine				0.0				0.0				0.0
Maryland				0.0				0.0				0.0
Massachusetts				0.0				0.0				0.0
Mississippi				0.0	0.0	51.8	0.0	51.8				0.0
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York				0.0				0.0				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island				0.0				0.0				0.0
South Carolina				0.0	0.0	0.8	0.0	0.8				0.0
Texas				0.0				0.0				0.0
Virgin Islands				0.0				0.0				0.0
Virginia				0.0	0.0	5.2	0.0	5.2	0.0	0.0	0.0	0.0
Washington				0.0	0.0	0.0	287.0	287.0				0.0
Total	0.0	399.2	0.0	399.2	0.0	63.0	287.0	350.0	19.3	315.8	0.0	335.1

Appendix C-4. Leading Pollutants and Stressors Impairing Assessed Estuaries

	16 - Flow Alterations				17 - Lead				18 - Exotic Species			
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Alabama	0.0	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0
Alaska				0.0				0.0				0.0
California	0.5	237.6	0.0	238.1	1.1	239.0	0.0	240.1	0.0	228.8	0.0	228.8
Connecticut				0.0				0.0				0.0
Delaware				0.0				0.0				0.0
Delaware River				0.0				0.0				0.0
District of Columbia				0.0				0.0				0.0
Florida				0.0	0.0	60.6	0.0	60.6				0.0
Georgia				0.0				0.0				0.0
Guam				0.0				0.0				0.0
Hawaii				0.0				0.0				0.0
Interstate Sanitation Commission				0.0				0.0				0.0
Louisiana	0.0	91.0	0.0	91.0				0.0				0.0
Maine				0.0				0.0				0.0
Maryland				0.0				0.0				0.0
Massachusetts				0.0				0.0				0.0
Mississippi				0.0				0.0				0.0
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York				0.0				0.0				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island				0.0				0.0				0.0
South Carolina				0.0				0.0				0.0
Texas				0.0				0.0				0.0
Virgin Islands				0.0				0.0				0.0
Virginia				0.0				0.0				0.0
Washington				0.0				0.0			0.0	0.0
Total	0.5	328.6	0.0	329.1	1.1	299.6	0.0	300.7	0.0	228.8	0.0	228.8

Appendix C-4. Leading Pollutants and Stressors Impairing Assessed Estuaries

Jurisdiction	19 - Arsenic Major	19 - Arsenic Minor/Mod	19 - Arsenic Not Specified	19 - Arsenic Total	20 - Unknown Toxicity Major	20 - Unknown Toxicity Minor/Mod	20 - Unknown Toxicity Not Specified	20 - Unknown Toxicity Total	Comment
Alabama				0.0	0.0	0.0	0.0	0.0	
Alaska				0.0				0.0	
California	0.0	163.4	0.0	163.4	0.3	117.1	0.0	117.5	Excessive algal growth caused minor impairments to <<1 square mile of estuarine waters.
Connecticut				0.0	0.0	6.7	0.0	6.7	Connecticut notes that all 612.46 assessed estuarine sq. miles are impaired by PCBs due to a statewide fish consumption advisory. The advisory is specific to striped bass and bluefish.
Delaware				0.0				0.0	
Delaware River				0.0				0.0	
District of Columbia				0.0				0.0	
Florida	0.0	20.1	0.0	20.1				0.0	
Georgia				0.0				0.0	
Guam				0.0				0.0	
Hawaii				0.0				0.0	
Interstate Sanitation Commission				0.0				0.0	
Louisiana				0.0				0.0	
Maine				0.0				0.0	Excludes the effect of a statewide consumption advisory for lobster tomalley due to dioxin and PCB contamination.
Maryland				0.0				0.0	Pfiesteria or Pfiesteria-like microorganisms affected 2.1 square miles.
Massachusetts				0.0				0.0	
Mississippi				0.0	0.0	41.2	0.0	41.2	
N Mariana Islands				0.0				0.0	
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
New Jersey				0.0				0.0	Pathogens are the primary cause of shellfish harvesting restrictions in New Jersey. New Jersey notes that their cause and source assessment is preliminary and these numbers will be updated in the near future.
New York				0.0				0.0	
North Carolina				0.0				0.0	
Oregon				0.0				0.0	
Puerto Rico				0.0				0.0	Puerto Rico reported linear miles of estuarine causes rather than square miles. The identified causes were metals and pathogens.
Rhode Island				0.0	0.0	0.0	0.0	0.0	
South Carolina				0.0				0.0	
Texas				0.0				0.0	
Virgin Islands				0.0				0.0	
Virginia				0.0				0.0	
Washington				0.0				0.0	
Total	0.0	183.5	0.0	183.5	0.4	165.0	0.0	165.4	

Appendix C-5. Leading Sources Impairing Assessed Estuaries

	1 - Natural Sources				2 - Municipal Point Sources				3 - Urban Runoff/Point Sources			
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Alabama	0.0	418.0	0.0	418.0	0.0	418.0	0.0	418.0	0.0	418.0	0.0	418.0
Alaska				0.0				0.0			10.9	10.9
California	0.0	430.5	0.0	430.5	0.0	482.5	0.0	482.5	22.6	377.4	0.0	400.0
Connecticut	0.0	297.8	0.0	297.8	321.3	100.5	0.0	421.7	6.3	456.2	0.0	462.5
Delaware	0.0	3.0	0.0	3.0	0.0	22.2	0.0	22.2				0.0
Delaware River				0.0	25.0	59.0	0.0	84.0	8.0	76.0	0.0	84.0
District of Columbia	0.0	3.4	0.0	3.4	3.1	0.0	0.0	3.1	0.8	5.1	0.0	5.9
Florida				0.0	0.0	278.5	0.0	278.5	0.0	233.7	0.0	233.7
Georgia				0.0	2.0	129.0	0.0	131.0	0.0	131.0	0.0	131.0
Guam				0.0				0.0				0.0
Hawaii	2.2	30.7	0.0	32.9				0.0	0.2	28.3	0.0	28.5
Interstate Sanitation Commission				0.0			307.6	307.6			103.2	103.2
Louisiana	0.0	983.0	0.0	983.0	0.0	235.0	0.0	235.0	0.0	781.0	0.0	781.0
Maine				0.0	3.3	0.0	0.0	3.3	0.0	49.1	0.0	49.1
Maryland	1,077.4	0.0	0.0	1,077.4	31.9	6.6	0.0	38.5	6.6	15.1	0.0	21.7
Massachusetts				0.0	0.0	0.0	70.4	70.4	0.0	0.0	101.1	101.1
Mississippi	0.0	130.1	0.0	130.1	0.0	36.5	0.0	36.5	0.0	115.9	0.0	115.9
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey			47.0	47.0			3.0	3.0			47.0	47.0
New York				0.0			28.7	28.7			109.3	109.3
North Carolina				0.0				0.0				0.0
Oregon				0.0	0.0	56.2	0.0	56.2	0.0	31.0	0.0	31.0
Puerto Rico				0.0				0.0				0.0
Rhode Island				0.0	0.0	40.9	0.0	40.9	0.4	25.0	0.0	25.4
South Carolina	3.8	0.0	0.0	3.8	6.3	0.2	0.0	6.5	12.3	3.1	0.0	15.3
Texas	0.0	107.8	0.0	107.8	117.5	39.1	0.0	156.6	80.1	8.0	0.0	88.1
Virgin Islands				0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.9	0.9
Virginia	64.4	150.3	0.0	214.7	0.5	0.0	0.0	0.5	2.4	10.1	0.0	12.5
Washington	0.0	0.0	1,473.6	1,473.6	0.0	0.0	702.9	702.9	0.0	0.0	205.8	205.8
Total	1,147.9	2,554.6	1,520.6	5,223.1	510.8	1,904.1	1,113.2	3,528.1	139.7	2,763.9	578.3	3,481.8

Appendix C-5. Leading Sources Impairing Assessed Estuaries

Jurisdiction	4 - Other				5 - Atmospheric Deposition				6 - Industrial Point Sources			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska			210.8	210.8				0.0			217.0	217.0
California	18.8	163.1	0.0	181.9	0.0	425.9	0.0	425.9	223.0	345.2	0.0	568.2
Connecticut				0.0	0.0	211.0	0.0	211.0	0.0	75.8	0.0	75.8
Delaware				0.0				0.0				0.0
Delaware River				0.0				0.0	8.0	76.0	0.0	84.0
District of Columbia				0.0				0.0				0.0
Florida	0.0	117.1	0.0	117.1				0.0	0.0	229.6	0.0	229.6
Georgia	1.0	2.0	0.0	3.0				0.0	4.0	158.0	0.0	162.0
Guam				0.0				0.0				0.0
Hawaii				0.0				0.0	0.0	0.6	0.0	0.6
Interstate Sanitation Commission			0.2	0.2				0.0				0.0
Louisiana	0.0	2,738.0	0.0	2,738.0	0.0	2,285.0	0.0	2,285.0	0.0	91.0	0.0	91.0
Maine				0.0				0.0				0.0
Maryland	55.4	0.0	0.0	55.4				0.0	31.9	15.7	0.0	47.6
Massachusetts				0.0				0.0	0.0	0.0	10.8	10.8
Mississippi				0.0				0.0	0.0	37.1	0.0	37.1
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York			1.3	1.3				0.0				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0	0.0	41.7	0.0	41.7
Puerto Rico				0.0				0.0				0.0
Rhode Island	0.3	0.0	0.0	0.3				0.0	0.0	9.7	0.0	9.7
South Carolina				0.0				0.0	0.0	0.2	0.0	0.2
Texas				0.0				0.0	33.2	3.4	0.0	36.6
Virgin Islands				0.0				0.0				0.0
Virginia	0.0	0.0	0.0	0.0				0.0	0.5	0.0	0.0	0.5
Washington	0.0	0.0	89.8	89.8				0.0	0.0	0.0	313.8	313.8
Total	75.5	3,020.2	302.1	3,397.8	0.0	2,921.9	0.0	2,921.9	300.6	1,084.0	541.6	1,926.1

Appendix C-5. Leading Sources Impairing Assessed Estuaries

Jurisdiction	7 - Agriculture				8 - Land Disposal				9 - Combined Sewer Overflow			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska				0.0			9.0	9.0				0.0
California	5.0	457.2	0.0	462.2	7.8	16.0	0.0	23.8	2.6	1.0	0.0	3.7
Connecticut	0.0	6.2	0.0	6.2	0.0	15.3	0.0	15.3	0.0	237.7	0.0	237.7
Delaware	0.0	12.0	0.0	12.0	0.0	10.2	0.0	10.2				0.0
Delaware River				0.0				0.0				0.0
District of Columbia				0.0				0.0	0.8	1.4	0.0	2.2
Florida	0.0	323.9	0.0	323.9	0.0	243.5	0.0	243.5				0.0
Georgia				0.0				0.0				0.0
Guam				0.0				0.0				0.0
Hawaii	0.0	12.0	0.0	12.0				0.0				0.0
Interstate Sanitation Commission				0.0			22.3	22.3			839.9	839.9
Louisiana	0.0	91.0	0.0	91.0	0.0	917.0	0.0	917.0				0.0
Maine				0.0				0.0	0.0	49.1	0.0	49.1
Maryland				0.0	0.0	13.1	0.0	13.1				0.0
Massachusetts	0.0	0.0	4.3	4.3	0.0	0.0	12.4	12.4	0.0	0.0	71.1	71.1
Mississippi				0.0	0.4	10.3	0.0	10.7				0.0
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey			16.0	16.0				0.0			5.0	5.0
New York				0.0			21.9	21.9			103.4	103.4
North Carolina				0.0				0.0				0.0
Oregon	0.0	56.2	0.0	56.2				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island	8.3	0.0	0.0	8.3	0.5	3.9	0.0	4.4	0.0	15.9	0.0	15.9
South Carolina	0.1	21.0	0.0	21.2	0.0	0.1	0.0	0.1				0.0
Texas	1.7	319.0	0.0	320.7	1.9	86.6	0.0	88.5				0.0
Virgin Islands				0.0	0.0	0.0	0.2	0.2				0.0
Virginia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Washington	0.0	0.0	492.6	492.6	0.0	0.0	115.8	115.8	0.0	0.0	122.7	122.7
Total	15.2	1,298.6	512.9	1,826.6	10.7	1,315.9	181.5	1,508.1	3.4	305.2	1,142.2	1,450.8

Appendix C-5. Leading Sources Impairing Assessed Estuaries

Jurisdiction	10 - Onsite WW Systems (Septic Tanks)				11 - Contaminated Sediments				12 - Collection System Failure			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0.0	0.0	0.0	0.0	0.0	0.0	418.0	0.0	418.0
Alaska				0.0			9.0	9.0				0.0
California				0.0	0.5	44.3	0.0	44.8				0.0
Connecticut	0.0	9.6	0.0	9.6	0.7	18.8	0.0	19.5				0.0
Delaware	0.0	10.2	0.0	10.2				0.0				0.0
Delaware River				0.0	8.0	858.0	0.0	866.0				0.0
District of Columbia				0.0				0.0				0.0
Florida				0.0				0.0				0.0
Georgia				0.0				0.0				0.0
Guam				0.0				0.0				0.0
Hawaii				0.0				0.0				0.0
Interstate Sanitation Commission			22.0	22.0			50.1	50.1				0.0
Louisiana	0.0	917.0	0.0	917.0				0.0	0.0	623.0	0.0	623.0
Maine				0.0				0.0				0.0
Maryland				0.0				0.0				0.0
Massachusetts				0.0	0.0	0.0	38.5	38.5				0.0
Mississippi	0.0	25.1	0.0	25.1	0.0	22.9	0.0	22.9				0.0
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York			21.9	21.9			127.3	127.3				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0	0.0	49.4	0.0	49.4
Puerto Rico				0.0				0.0				0.0
Rhode Island	0.5	2.0	0.0	2.5	0.0	0.2	0.0	0.2				0.0
South Carolina				0.0				0.0				0.0
Texas	1.9	86.6	0.0	88.5				0.0				0.0
Virgin Islands				0.0				0.0				0.0
Virginia				0.0				0.0	0.0	0.0	0.0	0.0
Washington	0.0	0.0	115.8	115.8				0.0				0.0
Total	2.4	1,050.5	159.7	1,212.7	9.3	944.1	224.8	1,178.2	0.0	1,090.4	0.0	1,090.4

Appendix C-5. Leading Sources Impairing Assessed Estuaries

Jurisdiction	13 - Other Urban Runoff				14 - Resource Extraction				15 - Hydromodification			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska			1.9	1.9			2.3	2.3				0.0
California	2.5	0.0	0.0	2.5	474.9	54.9	0.0	529.8	238.3	114.8	0.0	353.1
Connecticut				0.0				0.0				0.0
Delaware				0.0				0.0				0.0
Delaware River				0.0				0.0				0.0
District of Columbia	0.0	0.4	0.0	0.4	0.8	0.0	0.0	0.8	0.0	0.8	0.0	0.8
Florida				0.0	0.0	52.4	0.0	52.4	0.0	176.1	0.0	176.1
Georgia				0.0				0.0				0.0
Guam				0.0				0.0				0.0
Hawaii				0.0				0.0				0.0
Interstate Sanitation Commission				0.0				0.0				0.0
Louisiana	0.0	781.0	0.0	781.0				0.0				0.0
Maine				0.0				0.0				0.0
Maryland				0.0				0.0				0.0
Massachusetts				0.0				0.0				0.0
Mississippi	0.0	115.8	0.0	115.8				0.0	0.0	0.5	0.0	0.5
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York				0.0				0.0				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island	0.3	1.0	0.0	1.3				0.0				0.0
South Carolina				0.0				0.0	0.0	0.9	0.0	0.9
Texas				0.0				0.0				0.0
Virgin Islands				0.0				0.0				0.0
Virginia				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Washington				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2.7	898.2	1.9	902.8	475.7	107.3	2.3	585.2	238.3	293.1	0.0	531.4

Appendix C-5. Leading Sources Impairing Assessed Estuaries

Jurisdiction	16 - Recreation and Tourism (non-boating)				17 - Package Plants (small flows)				18 - Domestic Wastewater Lagoon			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0.0	0.0	0.0	0.0				0.0	0.0	418.0	0.0	418.0
Alaska				0.0				0.0				0.0
California	0.0	0.1	0.0	0.1	0.0	0.5	0.0	0.5				0.0
Connecticut	0.0	253.0	0.0	253.0				0.0				0.0
Delaware				0.0				0.0				0.0
Delaware River				0.0				0.0				0.0
District of Columbia				0.0				0.0				0.0
Florida				0.0				0.0				0.0
Georgia				0.0				0.0				0.0
Guam				0.0				0.0				0.0
Hawaii				0.0				0.0				0.0
Interstate Sanitation Commission				0.0				0.0				0.0
Louisiana	0.0	91.0	0.0	91.0	0.0	144.0	0.0	144.0				0.0
Maine				0.0	296.1	0.0	0.0	296.1				0.0
Maryland				0.0				0.0				0.0
Massachusetts				0.0				0.0				0.0
Mississippi	0.0	130.1	0.0	130.1	0.0	2.2	0.0	2.2				0.0
N Mariana Islands				0.0				0.0				0.0
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Jersey				0.0				0.0				0.0
New York				0.0				0.0				0.0
North Carolina				0.0				0.0				0.0
Oregon				0.0				0.0				0.0
Puerto Rico				0.0				0.0				0.0
Rhode Island	0.0	0.0	0.0	0.0				0.0				0.0
South Carolina				0.0				0.0				0.0
Texas				0.0				0.0				0.0
Virgin Islands				0.0				0.0				0.0
Virginia				0.0				0.0				0.0
Washington				0.0				0.0				0.0
Total	0.0	474.2	0.0	474.2	296.1	146.7	0.0	442.8	0.0	418.0	0.0	418.0

Appendix C-5. Leading Sources Impairing Assessed Estuaries

Jurisdiction	19 - Marinas				20 - Construction				Comment
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	
Alabama	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Alaska				0.0				0.0	"Other" refers to seafood processing. The state also reported 4.91 square miles impaired by military sources.
California	0.0	12.3	0.0	12.3	1.2	2.8	0.0	4.0	
Connecticut	0.0	81.9	0.0	81.9				0.0	
Delaware				0.0				0.0	
Delaware River				0.0				0.0	
District of Columbia				0.0				0.0	
Florida				0.0	0.0	177.9	0.0	177.9	
Georgia	0.0	66.0	0.0	66.0				0.0	Industrial nonpoint sources listed under "other" category. "Unknown sources" are nonpoint only.
Guam				0.0				0.0	
Hawaii	0.0	0.8	0.0	0.8	0.0	10.3	0.0	10.3	
Interstate Sanitation Commission				0.0			0.1	0.1	
Louisiana	0.0	75.0	0.0	75.0	0.0	91.0	0.0	91.0	
Maine				0.0				0.0	Excludes the effect of a statewide consumption advisory for lobster tomalley due to dioxin and PCB contamination. Maine has identified major industrial point sources as the source of these contaminants.
Maryland				0.0				0.0	
Massachusetts	0.0	0.0	1.8	1.8				0.0	
Mississippi	0.0	14.5	0.0	14.5	0.0	22.9	0.0	22.9	
N Mariana Islands				0.0				0.0	
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
New Jersey			39.0	39.0				0.0	New Jersey notes that their cause and source assessment is preliminary and these numbers will be updated in the near future.
New York				0.0			0.1	0.1	
North Carolina				0.0				0.0	
Oregon				0.0				0.0	
Puerto Rico				0.0				0.0	Puerto Rico reported linear miles of estuarine causes rather than square miles. The identified source was land disposal.
Rhode Island	2.1	4.1	0.0	6.2	0.0	0.0	0.0	0.0	
South Carolina	9.7	10.0	0.0	19.7				0.0	
Texas				0.0				0.0	
Virgin Islands	0.0	0.0	0.9	0.9				0.0	
Virginia				0.0				0.0	
Washington				0.0	0.0	0.0	0.0	0.0	
Total	11.7	264.6	41.8	318.1	1.2	305.0	0.2	306.3	

Appendix C-6. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Ocean Shoreline Waters

Jurisdiction	Full Support - Evaluated	Full Support - Monitored	Full Support - Not Specified	Full Support - Total	Threatened - Evaluated	Threatened - Monitored	Threatened - Not Specified	Threatened - Total	Impaired - Evaluated	Impaired - Monitored	Impaired - Not Specified	Impaired - Total
Alabama	50	0	0	50	0	0	0	0	0	0	0	0
Alaska	0	0	0	0				0	4	0	0	4
California	712	84	0	796	0	0	0	0	48	76	0	123
Connecticut				0				0				0
Delaware	0	0	25	25	0	0	0	0	0	0	0	0
Florida				0				0				0
Georgia				0				0				0
Guam	0	0	0	0	0	0	0	0	0	0	13	13
Hawaii	645	137	0	782	6	4	0	10	7	85	0	91
Louisiana				0				0				0
Maine				0				0				0
Maryland	0	32	0	32				0	0	0	0	0
Massachusetts				0				0				0
Mississippi	0	35	0	35	7	20	0	28	44	27	0	72
N Mariana Islands	0	0	0	0	0	0	0	0	0	0	1	1
New Hampshire	0	0	0	0				0	18	0	0	18
New Jersey			127	127			0	0			0	0
New York			117	117			0	0			3	3
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	225	102	0	327	136	47	0	183	0	40	0	40
Rhode Island	0	79	0	79	0	0	0	0	0	0	0	0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands	126	0	0	126	36	0	0	36	10	1	0	10
Virginia				0				0				0
Washington				0				0				0
Total	1,758	469	269	2,496	186	71	0	257	131	229	17	377
	56%	15%	9%	80%	6%	2%	0%	8%	4%	7%	1%	12%

Appendix C-6. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Ocean Shoreline Waters

Jurisdiction	Not Attainable - Evaluated	Not Attainable - Monitored	Not Attainable - Not Specified	Not Attainable - Total	Total Evaluated	Total Monitored	Total Unspecified	Total Assessed	Comment
Alabama				0	50	0	0	50	
Alaska				0	4	0	0	4	State reported overall use support status. Alaska's assessment data is biased towards those waters with known impairment; efforts are underway to assess other waters across the state.
California				0	760	160	0	919	
Connecticut				0	0	0	0	0	
Delaware				0	0	0	25	25	
Florida				0	0	0	0	0	
Georgia				0	0	0	0	0	
Guam				0	0	0	14	14	
Hawaii	0	1	0	1	658	227	0	884	
Louisiana				0	0	0	0	0	
Maine				0	0	0	0	0	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland				0	0	32	0	32	
Massachusetts				0	0	0	0	0	
Mississippi	0	0	0	0	52	82	0	134	
N Mariana Islands				0	0	0	1	1	
New Hampshire	0	0	0	0	18	0	0	18	
New Jersey				0	0	0	127	127	Entered swimming use support data in lieu of summary use support data. New Jersey reports impairment to shellfishing use, but assesses that use in square miles rather than shoreline (linear) miles.
New York				0	0	0	120	120	
North Carolina				0	0	0	0	0	
Oregon				0	0	0	0	0	
Puerto Rico	0	0	0	0	361	189	0	550	
Rhode Island	0	0	0	0	0	79	0	79	
South Carolina				0	0	0	0	0	
Texas				0	0	0	0	0	Texas reported square miles of coastal use support rather than shoreline miles. Of the 3879 square miles assessed, 3491 fully support all uses and 388 are impaired for one or more uses.
Virgin Islands				0	172	1	0	173	State reported overall use support status.
Virginia				0	0	0	0	0	
Washington				0	0	0	0	0	
Total	0	1	0	1	2,074	769	287	3,130	
	0%	0%	0%	0%	66%	25%	9%		

Appendix C-7a. Aquatic Life Use Support in Assessed Ocean Shoreline Waters

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	50	0	0	0	0	50	
Alaska						0	
California	791	0	51	0		842	
Connecticut						0	
Delaware	25		0	0		25	
Florida						0	
Georgia						0	
Guam						0	
Hawaii	0	0	0	0	0	0	
Louisiana						0	
Maine						0	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland	32		0	0		32	
Massachusetts						0	
Mississippi	33	35	0	0	0	68	
N Mariana Islands						0	
New Hampshire	18		0	0	0	18	
New Jersey						0	
New York	120	0	0	0		120	
North Carolina						0	
Oregon						0	
Puerto Rico	417	76	19	37	0	550	Entered "propogation and preservation of desirable species" use support status.
Rhode Island						0	
South Carolina						0	
Texas						0	All 3879 square miles of ocean waters assessed fully supported aquatic life use.
Virgin Islands	4	0	0	0		4	
Virginia						0	
Washington						0	
Total	1,489	111	70	37	0	1,707	
	87%	7%	4%	2%	0%		

Appendix C-7b. Fish Consumption Use Support in Assessed Ocean Shoreline Waters

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	50	0	0	0	0	50	
Alaska						0	
California	558	0	54	34		647	
Connecticut						0	
Delaware						0	
Florida						0	
Georgia						0	
Guam						0	
Hawaii	0	0	0	0	0	0	
Louisiana						0	
Maine						0	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland	32		0	0		32	
Massachusetts						0	
Mississippi	0	13	0	0	0	13	
N Mariana Islands						0	
New Hampshire	0		18	0	0	18	
New Jersey						0	
New York	0	0	0	0		0	
North Carolina						0	
Oregon						0	
Puerto Rico						0	Category not applicable.
Rhode Island						0	
South Carolina						0	
Texas						0	
Virgin Islands	12	0	8	0		20	
Virginia						0	
Washington						0	
Total	652	13	80	34	0	780	
	84%	2%	10%	4%	0%		

Appendix C-7c. Shellfishing Use Support in Assessed Ocean Shoreline Waters

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	50	0	0	0	0	50	
Alaska						0	
California	725	0	54	1		780	
Connecticut						0	
Delaware						0	
Florida						0	
Georgia						0	
Guam						0	
Hawaii	0	0	0	0	0	0	
Louisiana						0	
Maine						0	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland	32		0	0		32	
Massachusetts						0	
Mississippi	0	0	46	0	0	46	
N Mariana Islands						0	
New Hampshire	0		18	0	0	18	
New Jersey						0	New Jersey assessed ocean shellfishing use support in square miles rather than shoreline (linear) miles.
New York	117	0	0	0		117	
North Carolina						0	
Oregon						0	
Puerto Rico	0	0	0	0	0	0	
Rhode Island	79	0	0	0	0	79	
South Carolina						0	
Texas						0	Of the ocean waters assessed, 3491 sq. miles fully support shellfishing use and 388 do not support shellfishing use.
Virgin Islands	12	0	8	0		20	
Virginia						0	
Washington						0	
Total	1,014	0	127	1	0	1,141	
	89%	0%	11%	0%	0%		

Appendix C-7d. Swimming Use Support in Assessed Ocean Shoreline Waters

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	50	0	0	0	0	50	
Alaska						0	
California	716	0	91	25		832	
Connecticut						0	
Delaware	25		0	0		25	
Florida						0	
Georgia						0	
Guam	0	0	3	11		14	
Hawaii	0	0	0	0	0	0	
Louisiana						0	
Maine						0	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland	32		0	0		32	
Massachusetts						0	
Mississippi	28	99	51	0	0	178	
N Mariana Islands	0	0	0	1		1	
New Hampshire	18		0	0	0	18	
New Jersey	127	0	0	0		127	
New York	120	0	0	0		120	
North Carolina						0	
Oregon						0	
Puerto Rico	409	99	32	11	0	550	
Rhode Island	79	0	0	0	0	79	
South Carolina						0	
Texas						0	All 3879 square miles of ocean waters assessed fully supported swimming use.
Virgin Islands	112	0	0	1		113	
Virginia						0	
Washington						0	
Total	1,715	198	177	48	0	2,138	
	80%	9%	8%	2%	0%		

Appendix C-7e. Secondary Contact Use Support in Assessed Ocean Shoreline Waters

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Alabama	50	0	0	0	0	50	
Alaska						0	
California	777	0	51	4		832	
Connecticut						0	
Delaware	25		0	0		25	
Florida						0	
Georgia						0	
Guam						0	
Hawaii	0	0	0	0	0	0	
Louisiana						0	
Maine						0	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland						0	
Massachusetts						0	
Mississippi	0	6	26	0	0	31	
N Mariana Islands	0	0	0	1		1	
New Hampshire	18		0	0	0	18	
New Jersey						0	
New York	120	0	0	0		120	
North Carolina						0	
Oregon						0	
Puerto Rico	528	16	0	6	0	550	
Rhode Island						0	
South Carolina						0	
Texas						0	
Virgin Islands	12	0	8	0		20	
Virginia						0	
Washington						0	
Total	1,529	22	85	10	0	1,646	
	93%	1%	5%	1%	0%		

Appendix C-8. Leading Pollutants and Stressors Impairing Assessed Ocean Shoreline Waters

Jurisdiction	1 - Pathogens				2 - Turbidity				3 - Nutrients			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0	0	0	0	0	0	0	0	0	0	0	0
Alaska				0				0				0
California	26	65	0	91				0				0
Connecticut				0				0				0
Delaware	1	0	0	1				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii	2	56	0	58	14	107	0	121	18	123	0	141
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi	0	85	0	85	0	26	0	26	0	26	0	26
N Mariana Islands	1	0	0	1				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York			3	3				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	14	29	0	43	5	14	0	19	0	0	0	0
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands	0	0	9	9	0	0	10	10				0
Virginia				0				0				0
Washington				0				0				0
Total	43	235	12	290	19	146	10	176	18	149	0	167

Appendix C-8. Leading Pollutants and Stressors Impairing Assessed Ocean Shoreline Waters

Jurisdiction	4 - Suspended Solids				5 - Siltation				6 - pH			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0	0	0	0	0	0	0	0	0	0	0	0
Alaska				0				0				0
California				0				0				0
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii	0	108	0	108	0	104	0	104				0
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi				0				0	0	26	0	26
N Mariana Islands				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	0	0	0	0	0	0	0	0	8	13	0	21
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands				0	0	0	1	1	0	0	5	5
Virginia				0				0				0
Washington				0				0				0
Total	0	108	0	108	0	104	1	105	8	38	5	51

Appendix C-8. Leading Pollutants and Stressors Impairing Assessed Ocean Shoreline Waters

	7 - Metals				8 - Organic Enrichment/Low DO				9 - Cause Unknown			
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Alabama				0	0	0	0	0	0	0	0	0
Alaska				0				0				0
California	0	26	0	26				0				0
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii	0	2	0	2	0	2	0	2	0	2	0	2
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi	0	5	0	5	0	27	0	27				0
N Mariana Islands				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	18	0	18
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	11	0	0	11	3	0	0	3	0	0	0	0
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands				0	0	0	4	4				0
Virginia				0				0				0
Washington				0				0				0
Total	11	33	0	44	3	29	4	35	0	20	0	20

Appendix C-8. Leading Pollutants and Stressors Impairing Assessed Ocean Shoreline Waters

	10 - PCBs				11 - Cadmium				12 - Pesticides			
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**
Alabama				0				0	0	0	0	0
Alaska				0				0				0
California				0	0	16	0	16	2	10	0	12
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0				0				0
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi				0				0				0
N Mariana Islands				0				0				0
New Hampshire	0	18	0	18	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico				0				0	0	0	0	0
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands				0				0				0
Virginia				0				0				0
Washington				0				0				0
Total	0	18	0	18	0	16	0	16	2	10	0	12

Appendix C-8. Leading Pollutants and Stressors Impairing Assessed Ocean Shoreline Waters

Jurisdiction	13 - Lead				14 - Oil and Grease				15 - Unionized Ammonia			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0	0	0	0	0	0	0	0	0
Alaska				0			4	4				0
California	0	10	0	10				0				0
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0	0	2	0	2	0	4	0	4
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi				0				0				0
N Mariana Islands				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico				0	0	0	0	0	3	0	0	3
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands				0	0	0	1	1				0
Virginia				0				0				0
Washington				0				0				0
Total	0	10	0	10	0	2	5	7	3	4	0	7

Appendix C-8. Leading Pollutants and Stressors Impairing Assessed Ocean Shoreline Waters

Jurisdiction	16 - Priority Organic Chemicals				17 - Nonpriority Organic Chemicals				18 - Unknown Toxicity			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0	0	0	0	0	0	0	0	0	0	0	0
Alaska				0				0				0
California				0				0				0
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0				0				0
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi	0	6	0	6	0	6	0	6				0
N Mariana Islands				0				0	1	0	0	1
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	0	0	0	0	0	0	0	0	0	0	0	0
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands				0				0				0
Virginia				0				0				0
Washington				0				0				0
Total	0	6	0	6	0	6	0	6	1	0	0	1

Appendix C-8. Leading Pollutants and Stressors Impairing Assessed Ocean Shoreline Waters

Jurisdiction	19 - Dioxins				20 - Arsenic				Comment
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	
Alabama				0				0	
Alaska				0				0	
California				0				0	
Connecticut				0				0	
Delaware				0				0	
Florida				0				0	
Georgia				0				0	
Guam				0				0	
Hawaii				0				0	
Louisiana				0				0	
Maine				0				0	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland				0				0	
Massachusetts				0				0	
Mississippi				0				0	
N Mariana Islands				0				0	
New Hampshire	0	0	0	0	0	0	0	0	The category "cause unknown" accounts for the closure of the coastline for shellfish harvesting due to administrative reasons and not because of high pollutant levels.
New Jersey				0				0	
New York				0				0	
North Carolina				0				0	
Oregon				0				0	
Puerto Rico				0				0	
Rhode Island				0				0	
South Carolina				0				0	
Texas				0				0	Texas noted pathogens as the cause of 388 square miles of ocean water impairment.
Virgin Islands				0				0	
Virginia				0				0	
Washington				0				0	
Total	0	0	0	0	0	0	0	0	

Appendix C-9. Leading Sources Impairing Assessed Ocean Shoreline Waters

Jurisdiction	1 - Urban Runoff/Storm Sewers				2 - Natural Sources				3 - Land Disposal			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0	0	0	0	0	0	0	0	0	0	0	0
Alaska				0				0				0
California	5	86	0	91	0	16	0	16	0	24	0	24
Connecticut				0				0				0
Delaware	1	0	0	1				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii	5	51	0	56	3	95	0	98				0
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi	0	70	0	70	0	9	0	9	0	60	0	60
N Mariana Islands	1	0	0	1				0	1	0	0	1
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	6	7	0	13	10	1	0	11	5	27	0	32
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands	0	0	6	6				0	0	0	0	0
Virginia				0				0				0
Washington				0				0				0
Total	18	213	6	236	13	121	0	135	6	111	0	117

Appendix C-9. Leading Sources Impairing Assessed Ocean Shoreline Waters

Jurisdiction	4 - Municipal Point Sources				5 - Major Municipal Point Sources				6 - Other Urban Runoff			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0	0	0	0				0				0
Alaska				0				0				0
California				0				0	1	3	0	4
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0				0				0
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi	0	85	0	85	0	85	0	85	0	70	0	70
N Mariana Islands				0				0	1	0	0	1
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	3	3	0	6				0				0
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands	0	0	5	5	0	0	5	5				0
Virginia				0				0				0
Washington				0				0				0
Total	3	88	5	96	0	85	5	90	2	73	0	75

Appendix C-9. Leading Sources Impairing Assessed Ocean Shoreline Waters

Jurisdiction	7 - Spills				8 - Industrial Permitted				9 - Onsite Wastewater Systems			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0				0				0
Alaska			4	4				0				0
California	0	60	0	60				0				0
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0				0				0
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi				0	0	61	0	61	0	60	0	60
N Mariana Islands				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	0	0	0	0				0				0
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands	0	0	1	1				0				0
Virginia				0				0				0
Washington				0				0				0
Total	0	60	5	65	0	61	0	61	0	60	0	60

Appendix C-9. Leading Sources Impairing Assessed Ocean Shoreline Waters

	10 - Industrial Point Sources				11 - Agriculture				12 - Minor Industrial Point Sources			
Jurisdiction	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0	0	0	0	0	0	0	0				0
Alaska				0				0				0
California	0	1	0	1	0	28	0	28				0
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii	0	1	0	1	0	19	0	19				0
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi	0	43	0	43				0	0	43	0	43
N Mariana Islands				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico	3	4	0	6	0	0	0	0				0
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands	0	0	1	1				0				0
Virginia				0				0				0
Washington				0				0				0
Total	3	48	1	52	0	48	0	48	0	43	0	43

Appendix C-9. Leading Sources Impairing Assessed Ocean Shoreline Waters

Jurisdiction	13 - Recreation/Tourism (non-boating)				14 - Construction				15 - Source Unknown			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama	0	0	0	0	0	0	0	0	0	0	0	0
Alaska				0				0				0
California				0	0	3	0	3				0
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0	0	6	0	6	0	2	0	3
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi	0	40	0	40	0	26	0	26	0	9	0	9
N Mariana Islands				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	18	0	18
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico				0	0	0	0	0	0	2	0	2
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands				0				0	0	0	2	2
Virginia				0				0				0
Washington				0				0				0
Total	0	40	0	40	0	34	0	34	0	31	2	33

Appendix C-9. Leading Sources Impairing Assessed Ocean Shoreline Waters

Jurisdiction	16 - Land Development				17 - Resource Extraction				18 - Mine Tailings			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Alabama				0	0	0	0	0				0
Alaska				0				0				0
California				0	0	25	0	25	0	25	0	25
Connecticut				0				0				0
Delaware				0				0				0
Florida				0				0				0
Georgia				0				0				0
Guam				0				0				0
Hawaii				0				0				0
Louisiana				0				0				0
Maine				0				0				0
Maryland				0				0				0
Massachusetts				0				0				0
Mississippi	0	26	0	26				0				0
N Mariana Islands				0				0				0
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey				0				0				0
New York				0				0				0
North Carolina				0				0				0
Oregon				0				0				0
Puerto Rico				0	0	0	0	0				0
Rhode Island				0				0				0
South Carolina				0				0				0
Texas				0				0				0
Virgin Islands				0				0				0
Virginia				0				0				0
Washington				0				0				0
Total	0	26	0	26	0	25	0	25	0	25	0	25

Appendix C-9. Leading Sources Impairing Assessed Ocean Shoreline Waters

Jurisdiction	19 - Septage Disposal				20 - Marinas				Comment
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	
Alabama				0	0	0	0	0	
Alaska				0				0	
California	0	24	0	24	0	1	0	1	
Connecticut				0				0	
Delaware				0				0	
Florida				0				0	
Georgia				0				0	
Guam				0				0	
Hawaii				0	0	3	0	3	
Louisiana				0				0	
Maine				0				0	Maine includes coastal shoreline waters in their assessment of estuarine waters.
Maryland				0				0	
Massachusetts				0				0	
Mississippi				0	0	3	0	3	
N Mariana Islands				0				0	
New Hampshire	0	0	0	0	0	0	0	0	Other = administrative.
New Jersey				0				0	
New York				0				0	
North Carolina				0				0	
Oregon				0				0	
Puerto Rico				0	0	6	0	6	
Rhode Island				0				0	
South Carolina				0				0	
Texas				0				0	Texas noted land disposal (septic systems) as the source of 388 square miles of ocean water impairment.
Virgin Islands				0	0	0	9	9	
Virginia				0				0	
Washington				0				0	
Total	0	24	0	24	0	13	9	21	

Appendix D-1. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Wetlands

Jurisdiction	**Full Support - Evaluated**	**Full Support - Monitored**	**Full Support - Not Specified**	**Full Support - Total**	**Threatened - Evaluated**	**Threatened - Monitored**	**Threatened - Not Specified**	**Threatened - Total**	**Impaired - Evaluated**	**Impaired - Monitored**	**Impaired - Not Specified**
Alabama				0				0			
Alaska				0				0			
Arizona				0				0			
Arkansas				0				0			
California	14,946	0	0	14,946	708	3	0	711	112,809	9,742	0
Colorado				0				0			
Connecticut				0				0			
Cortina Rancheria				0				0			
Coyote Valley Reservation	0	0	0	0	0	0	0	0	2	0	0
Delaware				0				0			
District of Columbia				0				0			
Florida				0				0			
Georgia				0				0			
Guam				0				0			
Hawaii				0				0			
Idaho				0				0			
Illinois				0				0			
Indiana				0				0			
Iowa	1,900	0	0	1,900	12,539	0	0	12,539	18,782	0	0
Kansas	0	0	0	0	0	0	10,197	10,197	0	0	25,410
Kentucky				0			973,168	973,168			
La Jolla Band of Indians				0				0			
Louisiana	4,480	0	0	4,480	0	0	0	0	199,040	464,000	0
Maine				0				0			
Manzanita Band				0				0			
Maryland				0				0			
Massachusetts				0				0			
Michigan	0	10	0	10				0	0	0	0
Minnesota				0				0			
Mississippi				0				0			
Missouri				0				0			
Montana				0				0			
N Mariana Islands				0				0			
Nebraska				0				0			
Nevada	21,326	0	0	21,326				0	0	0	0
New Hampshire				0				0			
New Jersey				0				0			
New Mexico				0				0			
New York				0				0			
North Carolina			4,706,000	4,706,000				0			2,469,000
North Dakota				0				0			

Appendix D-1. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Wetlands

Jurisdiction	Impaired - Total	Total Evaluated	Total Monitored	Total Unspecified	Total Assessed	Comment
Alabama	0	0	0	0	0	
Alaska	0	0	0	0	0	
Arizona	0	0	0	0	0	
Arkansas	0	0	0	0	0	
California	122,551	128,463	9,745	0	138,208	
Colorado	0	0	0	0	0	
Connecticut	0	0	0	0	0	
Cortina Rancheria	0	0	0	0	0	
Coyote Valley Reservation	2	2	0	0	2	
Delaware	0	0	0	0	0	
District of Columbia	0	0	0	0	0	
Florida	0	0	0	0	0	
Georgia	0	0	0	0	0	
Guam	0	0	0	0	0	
Hawaii	0	0	0	0	0	
Idaho	0	0	0	0	0	
Illinois	0	0	0	0	0	
Indiana	0	0	0	0	0	
Iowa	18,782	33,221	0	0	33,221	
Kansas	25,410	0	0	35,607	35,607	Entered aquatic life use support since the state did not report on summary
Kentucky	0	0	0	973,168	973,168	
La Jolla Band of Indians	0	0	0	0	0	
Louisiana	663,040	203,520	464,000	0	667,520	
Maine	0	0	0	0	0	
Manzanita Band	0	0	0	0	0	
Maryland	0	0	0	0	0	
Massachusetts	0	0	0	0	0	
Michigan	0	0	10	0	10	The losses and/or gains of Michigan wetlands are not adequately tracked to provide a credible or even reasonable estimate of their loss or gain.
Minnesota	0	0	0	0	0	
Mississippi	0	0	0	0	0	
Missouri	0	0	0	0	0	
Montana	0	0	0	0	0	
N Mariana Islands	0	0	0	0	0	
Nebraska	0	0	0	0	0	Nebraska does not currently have acreage coverages for individual wetlands. Recent monitoring has failed to reveal water quality standard criteria exceedances.
Nevada	0	21,326	0	0	21,326	
New Hampshire	0	0	0	0	0	Not assessed because New Hampshire does not have specific water quality standards for wetlands.
New Jersey	0	0	0	0	0	
New Mexico	0	0	0	0	0	
New York	0	0	0	0	0	
North Carolina	2,469,000	0	0	7,175,000	7,175,000	
North Dakota	0	0	0	0	0	

Appendix D-1. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Wetlands

Jurisdiction	Full Support - Evaluated	Full Support - Monitored	Full Support - Not Specified	Full Support - Total	Threatened - Evaluated	Threatened - Monitored	Threatened - Not Specified	Threatened - Total	Impaired - Evaluated	Impaired - Monitored	Impaired - Not Specified
Ohio				0				0			
Oklahoma				0				0			
Oregon				0				0			
Pennsylvania				0				0			
Puerto Rico				0				0			
Rhode Island				0				0			
South Carolina				0				0			
South Dakota				0				0			
Tennessee	732,189	0	0	732,189				0	54,811	0	0
Texas				0				0			
Torres-Martinez Desert Band				0				0			
Twenty-Nine Palms Band				0				0			
Utah				0				0			
Vermont				0				0			
Virgin Islands	728	0	0	728	198	0	0	198	0	0	1
Virginia				0				0			
Washington				0				0			
West Virginia				0				0			
Wisconsin				0				0			
Wyoming				0				0			
Yavapai-Prescott Reservation				0				0			
Total	775,569	10	4,706,000	5,481,579	13,445	3	983,365	996,813	385,444	473,742	2,494,411
	8%	0%	48%	56%	0%	0%	10%	10%	4%	5%	25%

Appendix D-1. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Wetlands

Jurisdiction	Impaired - Total	Total Evaluated	Total Monitored	Total Unspecified	Total Assessed	Comment
Ohio	0	0	0	0	0	
Oklahoma	0	0	0	0	0	
Oregon	0	0	0	0	0	
Pennsylvania	0	0	0	0	0	
Puerto Rico	0	0	0	0	0	
Rhode Island	0	0	0	0	0	
South Carolina	0	0	0	0	0	
South Dakota	0	0	0	0	0	
Tennessee	54,811	787,000	0	0	787,000	
Texas	0	0	0	0	0	
Torres-Martinez Desert Band	0	0	0	0	0	The assessment of wetlands area on the Torres-Martinez reservation is included in the lakes assessment.
Twenty-Nine Palms Band	0	0	0	0	0	The wetlands associated with the Coachella Valley Stormwater Channel were included in the rivers and streams assessment.
Utah	0	0	0	0	0	
Vermont	0	0	0	0	0	
Virgin Islands	1	926	0	1	927	
Virginia	0	0	0	0	0	
Washington	0	0	0	0	0	
West Virginia	0	0	0	0	0	
Wisconsin	0	0	0	0	0	
Wyoming	0	0	0	0	0	
Yavapai-Prescott Reservation	0	0	0	0	0	
Total	3,353,596	1,174,458	473,755	8,183,776	9,831,988	
	34%	12%	5%	83%		

Appendix D-2. Leading Pollutants and Stressors Impairing Assessed Wetlands

Jurisdiction	**Sediment/ Siltation**	**Flow Alterations**	**Habitat Alterations**	**Filling and Draining**	**Nutrients**	**Low DO**	**Metals**	**Exotic Species**	**Pathogens**	**Unknown Toxicity**	**Water Diversions**	**Noxious Aquatic Plants**	**Priority Organic Chemicals**	**Natural**
Alabama														
Alaska														
Arizona														
Arkansas														
California	X	X	X	X	X	X	X	X	X	X			X	
Colorado														
Connecticut														
Cortina Rancheria														
Coyote Valley Reservation	X	X	X					X						
Delaware														
District of Columbia														
Florida														
Georgia														
Guam	X	X	X	X							X			X
Hawaii														
Idaho														
Illinois														
Indiana														
Iowa	X	X			X			X				X		
Kansas	X	X			X	X								
Kentucky														
La Jolla Band of Indians														
Louisiana						X	X							
Maine														
Manzanita Band														
Maryland														
Massachusetts														
Michigan														
Minnesota	X		X	X	X		X			X		X		
Mississippi														
Missouri														
Montana														
N Mariana Islands				X										
Nebraska	X		X	X							X			
Nevada														
New Hampshire														
New Jersey														
New Mexico														
New York														
North Carolina														
North Dakota														
Ohio														
Oklahoma														
Oregon														
Pennsylvania														
Puerto Rico														
Rhode Island														

Appendix D-2. Leading Pollutants and Stressors Impairing Assessed Wetlands

Jurisdiction	Ammonia	Pesticides	Salinity/TSS/Chlorides	Oil and Grease	Weeds	Total Toxics	Comment
Alabama							
Alaska							
Arizona							
Arkansas							
California	X	X	X	X		X	
Colorado							
Connecticut							
Cortina Rancheria							
Coyote Valley Reservation					X		
Delaware							
District of Columbia							
Florida							
Georgia							
Guam							
Hawaii							
Idaho							
Illinois							
Indiana							
Iowa							
Kansas							
Kentucky							
La Jolla Band of Indians							
Louisiana							
Maine							
Manzanita Band							
Maryland							
Massachusetts							
Michigan							
Minnesota							
Mississippi							
Missouri							
Montana							
N Mariana Islands							
Nebraska							
Nevada							
New Hampshire							NH notes all have occurred, or have the potential to do so, but none have been identified as a significant threat to wetlands
New Jersey							
New Mexico							
New York							
North Carolina							
North Dakota							
Ohio							
Oklahoma							
Oregon							
Pennsylvania							
Puerto Rico							
Rhode Island							

Appendix D-2. Leading Pollutants and Stressors Impairing Assessed Wetlands

Jurisdiction	Sediment/ Siltation	Flow Alterations	Habitat Alterations	Filling and Draining	Nutrients	Low DO	Metals	Exotic Species	Pathogens	Unknown Toxicity	Water Diversions	Noxious Aquatic Plants	Priority Organic Chemicals	Natural
South Carolina														
South Dakota														
Tennessee	X	X	X	X									X	
Texas														
Torres-Martinez Desert Band														
Twenty-Nine Palms Band														
Utah														
Vermont														
Virgin Islands	X					X			X					
Virginia														
Washington														
West Virginia														
Wisconsin														
Wyoming														
Yavapai-Prescott Reservation														
Total	9	6	6	6	4	4	3	3	2	2	2	2	2	1

X - The state, tribe, or territory reported that the pollutant or stressor is responsible for impairment to assessed wetlands.

Appendix D-2. Leading Pollutants and Stressors Impairing Assessed Wetlands

Jurisdiction	Ammonia	Pesticides	Salinity/TSS/Chlorides	Oil and Grease	Weeds	Total Toxics	Comment
South Carolina							
South Dakota							
Tennessee							
Texas							
Torres-Martinez Desert Band							
Twenty-Nine Palms Band							
Utah							
Vermont							
Virgin Islands							
Virginia							
Washington							
West Virginia							
Wisconsin							
Wyoming							
Yavapai-Prescott Reservatio							
Total	1	1	1	1	1	1	
X - The state, tribe, or territor							

Appendix D-3. Leading Sources Impairing Assessed Wetlands

Jurisdiction	Agriculture	Hydrologic Modification	Development (General)	Filling and Draining	Urban Runoff	Resource Extraction	Construction	Road Construction	Natural
Alabama									
Alaska									
Arizona									
Arkansas									
California	X	X		X	X	X	X		X
Colorado									
Connecticut									
Cortina Rancheria									
Coyote Valley Reservation	X		X						
Delaware									
District of Columbia									
Florida									
Georgia									
Guam	X	X	X	X	X	X	X	X	X
Hawaii									
Idaho									
Illinois									
Indiana									
Iowa	X	X							
Kansas	X	X							X
Kentucky									
La Jolla Band of Indians									
Louisiana									
Maine									
Manzanita Band									
Maryland									
Massachusetts									
Michigan									
Minnesota	X	X	X	X	X	X	X	X	
Mississippi									
Missouri									
Montana									
N Mariana Islands			X						
Nebraska	X	X	X	X		X		X	
Nevada									
New Hampshire									

Appendix D-3. Leading Sources Impairing Assessed Wetlands

Jurisdiction	Channelization	Landfills	Municipal Point Sources	Habitat Modifications	Spills	Livestock Grazing	Dredging	Recreation	Silviculture	Public Projects
Alabama										
Alaska										
Arizona										
Arkansas										
California	X	X		X	X	X		X	X	
Colorado										
Connecticut										
Cortina Rancheria										
Coyote Valley Reservation			X							X
Delaware										
District of Columbia										
Florida										
Georgia										
Guam	X	X					X	X		X
Hawaii										
Idaho										
Illinois										
Indiana										
Iowa				X						
Kansas										
Kentucky										
La Jolla Band of Indians										
Louisiana										
Maine										
Manzanita Band										
Maryland										
Massachusetts										
Michigan										
Minnesota		X	X	X	X	X	X		X	
Mississippi										
Missouri										
Montana										
N Mariana Islands										
Nebraska										
Nevada										
New Hampshire										

Appendix D-3. Leading Sources Impairing Assessed Wetlands

Jurisdiction	Commercial Development	Ground Water Loadings	Land Disposal	Industrial Point Sources	Comment
Alabama					
Alaska					
Arizona					
Arkansas					
California		X	X	X	
Colorado					
Connecticut					
Cortina Rancheria					
Coyote Valley Reservation					An encroaching parking and garden are responsible for wetlands integrity degradation.
Delaware					
District of Columbia					
Florida					
Georgia					
Guam	X				
Hawaii					
Idaho					
Illinois					
Indiana					
Iowa					
Kansas					
Kentucky					
La Jolla Band of Indians					
Louisiana					Louisiana reports that atmospheric deposition and unknown sources impact wetlands.
Maine					
Manzanita Band					
Maryland					
Massachusetts					
Michigan					
Minnesota	X				
Mississippi					
Missouri					
Montana					
N Mariana Islands					
Nebraska					Many of the sources identified are mitigated.
Nevada					
New Hampshire					NH notes most of these occur to a limited degree, but none have been identified as a significant threat to wetlands integrity.

Appendix D-3. Leading Sources Impairing Assessed Wetlands

Jurisdiction	Agriculture	Hydrologic Modification	Development (General)	Filling and Draining	Urban Runoff	Resource Extraction	Construction	Road Construction	Natural
New Jersey									
New Mexico									
New York									
North Carolina									
North Dakota									
Ohio									
Oklahoma									
Oregon									
Pennsylvania									
Puerto Rico									
Rhode Island									
South Carolina									
South Dakota									
Tennessee	X	X	X	X			X	X	
Texas									
Torres-Martinez Desert Band									
Twenty-Nine Palms Band									
Utah									
Vermont									
Virgin Islands					X				
Virginia									
Washington									
West Virginia									
Wisconsin									
Wyoming									
Yavapai-Prescott Reservation									
Total	8	7	6	5	4	4	4	4	3

X - The state, tribe, or territory reported that the source is responsible for impairment to assessed wetlands.

Appendix D-3. Leading Sources Impairing Assessed Wetlands

Jurisdiction	**Channelization**	**Landfills**	**Municipal Point Sources**	**Habitat Modifications**	**Spills**	**Livestock Grazing**	**Dredging**	**Recreation**	**Silviculture**	**Public Projects**
New Jersey										
New Mexico										
New York										
North Carolina										
North Dakota										
Ohio										
Oklahoma										
Oregon										
Pennsylvania										
Puerto Rico										
Rhode Island										
South Carolina										
South Dakota										
Tennessee	X									
Texas										
Torres-Martinez Desert Band										
Twenty-Nine Palms Band										
Utah										
Vermont										
Virgin Islands			X		X					
Virginia										
Washington										
West Virginia										
Wisconsin										
Wyoming										
Yavapai-Prescott Reservation										
Total	3	3	3	3	3	2	2	2	2	2
X - The state, tribe, or territory										

Appendix D-3. Leading Sources Impairing Assessed Wetlands

Jurisdiction	Commercial Development	Ground Water Loadings	Land Disposal	Industrial Point Sources	Comment
New Jersey					
New Mexico					
New York					
North Carolina					
North Dakota					
Ohio					
Oklahoma					
Oregon					
Pennsylvania					
Puerto Rico					
Rhode Island					
South Carolina					
South Dakota					
Tennessee		X			
Texas					
Torres-Martinez Desert Band					
Twenty-Nine Palms Band					
Utah					
Vermont					
Virgin Islands					
Virginia					
Washington					
West Virginia					
Wisconsin					
Wyoming					
Yavapai-Prescott Reservation					
Total	2	2	1	1	
X - The state, tribe, or territory					

Appendix D-4. Leading Sources of Recent Wetlands Losses

Jurisdiction	**Development and Urban Growth**	**Agriculture**	**Road/Highway/ Bridge Construction**	**Filling and Draining**	**Construction (General)**	**Industrial Development**	**Hydrologic Modifications**	**Channelization**	**Commercial Development**	**Dredging**	**Resource Extraction**	**Utilities**	**Impoundments**
Alabama													
Alaska													
Arizona													
Arkansas													
California													
Colorado													
Connecticut													
Cortina Rancheria													
Coyote Valley Reservation	X												
Delaware													
District of Columbia													
Florida													
Georgia													
Guam	X	X	X	X	X	X	X	X		X			
Hawaii													
Idaho													
Illinois													
Indiana													
Iowa	X	X	X	X		X		X	X			X	
Kansas	X	X	X		X		X						
Kentucky													
La Jolla Band of Indians													
Louisiana													
Maine													
Manzanita Band													
Maryland													
Massachusetts													
Michigan													
Minnesota	X	X	X	X	X	X	X	X	X	X	X	X	X
Mississippi													
Missouri													
Montana													
N Mariana Islands				X									
Nebraska													
Nevada													
New Hampshire	X	X	X	X	X	X	X	X	X	X	X	X	X
New Jersey													
New Mexico													
New York													
North Carolina													
North Dakota													
Ohio													
Oklahoma													
Oregon													
Pennsylvania													
Puerto Rico													
Rhode Island													
South Carolina													
South Dakota													
Tennessee	X	X	X	X	X								
Texas													
Torres-Martinez Desert Band													
Twenty-Nine Palms Band													
Utah													
Vermont	X	X	X			X							

Appendix D-4. Leading Sources of Recent Wetlands Losses

Jurisdiction	**Development and Urban Growth**	**Agriculture**	**Road/Highway/ Bridge Construction**	**Filling and Draining**	**Silviculture**	**Recreation**	**Public Projects**	**Construction of Wharves, Piers, Bulkheads**	**Marinas**	**Land Disposal**	**Landfills**	**Mosquito Control**	**Peat Mining**
Alabama													
Alaska													
Arizona													
Arkansas													
California													
Colorado													
Connecticut													
Cortina Rancheria													
Coyote Valley Reservation	X												
Delaware													
District of Columbia													
Florida													
Georgia													
Guam	X	X	X	X			X						
Hawaii													
Idaho													
Illinois													
Indiana													
Iowa	X	X	X	X		X	X						
Kansas	X	X	X										
Kentucky													
La Jolla Band of Indians													
Louisiana													
Maine													
Manzanita Band													
Maryland													
Massachusetts													
Michigan													
Minnesota	X	X	X	X	X				X	X	X	X	X
Mississippi													
Missouri													
Montana													
N Mariana Islands				X									
Nebraska													
Nevada													
New Hampshire	X	X	X	X	X			X					
New Jersey													
New Mexico													
New York													
North Carolina													
North Dakota													
Ohio													
Oklahoma													
Oregon													
Pennsylvania													
Puerto Rico													
Rhode Island													
South Carolina													
South Dakota													
Tennessee	X	X	X	X									
Texas													
Torres-Martinez Desert Band													
Twenty-Nine Palms Band													
Utah													
Vermont	X	X	X										

Appendix D-4. Leading Sources of Recent Wetlands Losses

Jurisdiction	Development and Urban Growth	Agriculture	Road/Highway/ Bridge Construction	Filling and Draining	Comment
Alabama					
Alaska					
Arizona					
Arkansas					
California					
Colorado					
Connecticut					
Cortina Rancheria					
Coyote Valley Reservation	X				
Delaware					
District of Columbia					
Florida					
Georgia					
Guam	X	X	X	X	
Hawaii					
Idaho					
Illinois					
Indiana					
Iowa	X	X	X	X	
Kansas	X	X	X		
Kentucky					
La Jolla Band of Indians					
Louisiana					
Maine					
Manzanita Band					
Maryland					
Massachusetts					
Michigan					
Minnesota	X	X	X	X	
Mississippi					
Missouri					
Montana					
N Mariana Islands				X	
Nebraska					
Nevada					
New Hampshire	X	X	X	X	NH notes sources are regulated by state law and have limited net impact on wetlands.
New Jersey					
New Mexico					
New York					
North Carolina					
North Dakota					
Ohio					
Oklahoma					
Oregon					
Pennsylvania					
Puerto Rico					
Rhode Island					
South Carolina					
South Dakota					
Tennessee	X	X	X	X	
Texas					
Torres-Martinez Desert Band					
Twenty-Nine Palms Band					
Utah					
Vermont	X	X	X		

Appendix D-4. Leading Sources of Recent Wetlands Losses

Jurisdiction	**Development and Urban Growth**	**Agriculture**	**Road/Highway/ Bridge Construction**	**Filling and Draining**	**Construction (General)**	**Industrial Development**	**Hydrologic Modifications**	**Channelization**	**Commercial Development**	**Dredging**	**Resource Extraction**	**Utilities**	**Impoundments**
Virgin Islands													
Virginia													
Washington													
West Virginia													
Wisconsin													
Wyoming	X	X	X								X		
Yavapai-Prescott Reservation		X							X				
Total	9	9	8	6	5	5	4	4	4	3	3	3	2

X - The state, tribe, or territory reported that the source is responsible wetlands loss.

Appendix D-4. Leading Sources of Recent Wetlands Losses

Jurisdiction	Development and Urban Growth	Agriculture	Road/Highway/ Bridge Construction	Filling and Draining	Silviculture	Recreation	Public Projects	Construction of Wharves, Piers, Bulkheads	Marinas	Land Disposal	Landfills	Mosquito Control	Peat Mining
Virgin Islands													
Virginia													
Washington													
West Virginia													
Wisconsin													
Wyoming	X	X	X			X							
Yavapai-Prescott Reservation		X											
Total	9	9	8	6	2	2	2	1	1	1	1	1	1

X - The state, tribe, or territory reported that the source is responsible wetlands loss.

Appendix D-4. Leading Sources of Recent Wetlands Losses

Jurisdiction	Development and Urban Growth	Agriculture	Road/Highway/ Bridge Construction	Filling and Draining	Comment
Virgin Islands					The Virgin Islands note they have not had recent wetland losses.
Virginia					
Washington					
West Virginia					
Wisconsin					
Wyoming	X	X	X		
Yavapai-Prescott Reservation		X			
Total	9	9	8	6	
X - The state, tribe, or territory reported that the source is responsible wetlands loss.					

Appendix D-5. Development of Wetland Water Quality Standards by States, Tribes, and Territories

Jurisdiction	In Place						Under Development						Proposed						Implementation Procedure	Comment
	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation		
Alabama																			Waters in wetlands are waters of the State, but wetlands are not defined for inherent values, e.g. habitat.	
Alaska																				
Arizona	X	X	X			X				X	X								No wetlands specific standards; instead, existing uses and narrative and numeric standards apply to wetlands.	
Arkansas																			State defines wetlands, but does not have wetlands standards or legislation. They are protected under water quality standards of the 404/401 process.	
California																				
Colorado																				
Connecticut		X	X			X	X												Municipal jurisdiction	
Cortina Rancheria																				
Coyote Valley Reservation							X									X	X	X		
Delaware						X	X	X	X										Wetlands are waters of the state; now developing criteria and uses for wetlands.	
District of Columbia	X					X				X							X		District has adopted a set of water quality standards for the protection of its wetlands.	
Florida	X	X	X	X	X	X				X	X					X	X		Wetlands are waters of the State, regulated using the same standards as other waterbodies.	Narrative and numeric biocriteria are in place but revisions are under development.
Georgia	X	X	X	X		X													Wetlands are waters of the State, regulated using the same standards as other waterbodies.	
Guam	X	X	X			X														
Hawaii							X						X						Wetlands are waters of the state - HI has developed a Wetlands Water Quality Advisory Committee to develop state wetland water quality standards.	
Idaho																			Idaho has developed Section 401 rules and regulations to offer protection to wetlands.	
Illinois																				
Indiana							X	X		X		X							Wetland water quality standards are currently under development.	

Appendix D-5. Development of Wetland Water Quality Standards by States, Tribes, and Territories

Jurisdiction	In Place						Under Development						Proposed						Implementation Procedure	Comment
	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation		
Iowa	X	X	X	X		X													Section 401, wasteload allocations, specific wetlands identified in State standards.	
Kansas	X	X		X		X									X		X		Waters of the state, designations for noncontact recreation, food procurement, and aquatic life support.	Nutrient criteria and biocriteria were proposed by EPA for adoption in 2003.
Kentucky																			Wetlands are waters of the State, but standards do not have specific wetlands criteria.	
La Jolla Band of Indians																				
Louisiana	X				X															
Maine										X	X	X							No regs for implementing Section 401.	
Manzanita Band																				
Maryland	X	X	X																Wetlands are defined as waters of the State.	
Massachusetts	X	X	X									X								
Michigan																			State water quality standards apply to all waters of the State, including wetlands.	
Minnesota	X	X	X			X				X	X								Numeric criteria in place as compared to background concentrations of selected parameters. Interpretation and implementation is in its infancy.	
Mississippi		X																	Wetlands-specific standards under consideration. Narrative criteria are currently considered applicable to wetlands.	
Missouri	X	X	X	X		X					X								Wetlands are waters of the State, but are not subdivided by classes or uses.	
Montana											X								Standards for lakes and rivers apply to wetlands, but may not be technically appropriate.	
N Mariana Islands																				
Nebraska	X	X	X	X		X													Specific standards for wetlands.	
Nevada																				
New Hampshire																			Waters of the state, but criteria have not been defined for wetlands.	NH has a strong wetlands law, which has minimized the need to use Section 401 for wetlands protection.

Appendix D-5. Development of Wetland Water Quality Standards by States, Tribes, and Territories

	In Place						Under Development						Proposed							
Jurisdiction	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	**Implementation Procedure**	**Comment**
New Jersey																			Wetlands are waters of the State; in the future, New Jersey will develop standards for wetlands.	
New Mexico																			Wetlands are "waters of the State" and are protected under general standards, antidegradation policy, and any attainable use under state standards.	
New York						X	X	X											A number of guidance documents are being developed. DEC also has prepared administrative documents necessary for promulgating regulations.	
North Carolina																			Waters of the State; protected by State water quality laws and rules.	
North Dakota							X	X	X	X	X	X							Wetlands are waters of the State; the Health Department has proposed a standards implementation method.	
Ohio																				
Oklahoma																			Currently, there are no specific water quality standards for wetlands.	
Oregon	X			X		X	X			X	X	X							Oregon is considering additional criteria specifically tailored to wetlands.	
Pennsylvania	X	X	X			X													Wetlands are waters of the Commonwealth, subject to all provisions of PA's water quality standards.	
Puerto Rico						X													No standards or designated uses for wetlands, but antidegradation applies to wetlands.	
Rhode Island	X			X		X													State Section 401 Water Quality Certification and wetlands are waters of the State.	
South Carolina																			Wetlands assume standards of adjacent waterbodies; the State is considering wetlands-specific standards.	
South Dakota	X	X				X													Wetlands are waters of the State, designated for wildlife propagation and stock watering.	

Appendix D-5. Development of Wetland Water Quality Standards by States, Tribes, and Territories

	In Place						Under Development						Proposed							
Jurisdiction	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	**Implementation Procedure**	**Comment**
Tennessee																			No water quality standards specific to wetlands. As waters of the state, they are equally protected under existing use classifications and criteria.	
Texas		X				X													Waters of the State; considering wetlands standards and clarifying general criteria applied to wetlands.	
Torres-Martinez Desert Band																				
Twenty-Nine Palms Band																				
Utah						X													Antidegradation applies to wetlands. Surface waters on wetlands are protected under State water quality standards as are all other surface waters.	
Vermont	X	X	X	X		X					X								Classification system defines the level of protection afforded to a particular wetland.	Vermont also has wetland rules which protect the functions and values of many wetlands, regardless of size.
Virgin Islands		X				X	X		X											Revision of Water Quality Standards will be addressed in a 604(b) program.
Virginia																			Wetlands are waters of the state. Wetlands uses are tied to water quality standards.	
Washington																				
West Virginia						X				X	X		X							
Wisconsin	X	X		X		X													Program and criteria in place.	
Wyoming																			Wetlands included in definition of waters of the state.	
Yavapai-Prescott Reservation																				
Total	19	19	13	10	2	24	9	4	3	9	10	5	2	0	1	2	4	1		

X - State, tribe, or territory reported program status.

Appendix E-1. Number of Fish Consumption Advisories

Jurisdiction	Rivers	Lakes, Reservoirs, Ponds	Great Lakes	Estuaries	Bayous	Coastal	Wetland	Multi-class Waters	Statewide	Total Advisories	Comment
Alabama	9	3				1				13	
Alaska										0	
American Samoa				1						1	
Arizona	3	2								5	
Arkansas	8	9			3			1		21	
California	4	9		2		11		1		27	
Colorado		11								11	
Connecticut	4	6		1					1	12	
Delaware	6	2		6						14	
District of Columbia									1	1	
Florida	28	52				8		10		98	
Georgia	61	31		3			1			96	
Hawaii	2			1						3	
Idaho		1								1	
Illinois	14	12	1							27	
Indiana	117	50	1						1	169	
Iowa	1	1								2	
Kansas	10	1								11	
Kentucky	4	1						1		6	
Louisiana	6	9		1	5	1		1		23	
Maine	10					1			2	13	
Maryland		1		2						3	
Massachusetts	17	55		4		1		1	1	79	
Massachusetts - Federal		2								2	
Michigan	58	46	14				1		1	120	
Michigan - Tribal		13								13	
Minnesota	85	739	1							825	
Mississippi	8	4				1				13	
Missouri	4							2		6	Missouri has one regional advisory included in the total for Multi-class.
Montana	3	20								23	
Nebraska	19	15								34	
Nevada	1	1								2	
New Hampshire	2	1				1			1	5	
New Jersey	14	24		6		2		1	1	48	
New Mexico	3	23								26	
New York	23	41	8	3		3			1	79	
North Carolina	6	8		1				1	1	17	North Carolina has one regional advisory included in the total for Multi-class.
North Dakota	2	18								20	
Ohio	45	4	2						1	52	
Oklahoma	1	1								2	
Oregon	6	6								12	
Pennsylvania	22	2	2	1						27	
Puerto Rico										0	
Rhode Island	1					1				2	
South Carolina	15	10						1		26	
South Dakota										0	
Tennessee	7	9						1		17	

Appendix E-1. Number of Fish Consumption Advisories

Jurisdiction	Rivers	Lakes, Reservoirs, Ponds	Great Lakes	Estuaries	Bayous	Coastal	Wetland	Multi-class Waters	Statewide	Total Advisories	Comment
Texas	4	13		2		1				20	
Utah	1	1								2	
Vermont	1	3							1	5	
Virginia	7									7	
Virgin Islands										0	
Washington	1	1		6		2				10	
West Virginia	8									8	
Wisconsin	95	249	3							347	
Wisconsin - Tribal		100								100	
Wyoming										0	
Total	746	1,610	32	40	8	34	2	21	13	2,506	
Percent	30%	64%	1%	2%	0%	1%	0%	1%	1%		

Data from the National Listing of Fish and Wildlife Advisories.
Advisories issued by the state, cities, counties, and local health departments were combined in this report.
Advisories on canal waters are included in the total for rivers.

Appendix E-2. Number of Fish Advisories Caused by Individual Pollutants

Jurisdiction	Mercury	PCBs (Total)	Chlordane	Dioxins	Other Pesticides	DDT, DDE, DDD	Selenium	Comment
Alabama	4	5	3			2		
Alaska								
American Samoa	1	1				1		
Arizona	2		3		3	3		
Arkansas	19	1		1				
California	11	13	1		1	13	3	
Colorado	8		3		3		1	
Connecticut	5	6	1					Connecticut has a statewide advisory for mercury.
Delaware		13		1	1			
District of Columbia		1						The District of Columbia has a statewide advisory for PCBs.
Florida	97			1				
Georgia	80	25	1		1	1		
Hawaii		1			1			
Idaho	1							
Illinois	2	18	9					
Indiana	126	125						Indiana has statewide advisories for mercury and PCBs.
Iowa		2	1					
Kansas			11					
Kentucky	1	5	1					
Louisiana	17	4		2				
Maine	1	10		8				Maine has statewide advisories for cadmium and mercury.
Maryland			3					
Massachusetts	56	20	4	1		3		Massachusetts has a statewide advisory for mercury.
Massachusetts - Federal	2							
Michigan	40	104	14	7		1		Michigan has a statewide advisory for mercury.
Michigan - Tribal	13							
Minnesota	821	83						
Mississippi	8	5		1				
Missouri		4	4					
Montana	22	4						
Nebraska	12	22			12			
Nevada	2							
New Hampshire	2	2		1				New Hampshire has a statewide advisory for mercury.
New Jersey	30	12	6	9				New Jersey has a statewide advisory for mercury.
New Mexico	26							
New York	17	47	14	8	8	4		New York has statewide advisories for chlordane, DDT, mirex, and PCBs.
North Carolina	10			5			2	North Caroliona has a statewide advisory for mercury.
North Dakota	20							

Appendix E-2. Number of Fish Advisories Caused by Individual Pollutants

Jurisdiction	Mercury	PCBs (Total)	Chlordane	Dioxins	Other Pesticides	DDT, DDE, DDD	Selenium	Comment
Ohio	21	37	3		1			Ohio has a statewide advisory for mercury.
Oklahoma	1				1	1		
Oregon	9	2		1		1		
Pennsylvania	1	22	7		2			
Puerto Rico								
Rhode Island	1	2		1				
South Carolina	24	3						
South Dakota								
Tennessee	2	11	6	1				
Texas	7	5	7	1	4	4	3	
Utah							2	
Vermont	3	2						Vermont has a statewide advisory for mercury.
Virginia	3	3			1			
Virgin Islands								
Washington	1	2		2	1	1		
West Virginia		3	1	6				
Wisconsin	302	54	1	2				
Wisconsin - Tribal	100							
Wyoming								
Total	1,931	679	104	59	40	35	11	
Percent*	77%	27%	4%	2%	2%	1%	0%	

Data from the National Listing of Fish and Wildlife Advisories.

* Percentage of 2,506 total fish advisories in effect.

Appendix E-3. Shellfish Harvesting Restrictions due to Pathogens Reported by States, Territories, and Commissions

Jurisdiction	Number of Waterbodies with Restrictions	Approved (sq. miles)	Conditionally Approved[a] (sq. miles)	Restricted[b] (sq. miles)	Prohibited[c] (sq. miles)	Management Closures[d] (sq. miles)	Total Area Affected[e] (sq. miles)	Comment
Alabama								
Alaska								
California								
Connecticut								
Delaware								
Delaware River				97.00			97.00	
District of Columbia								The District of Columbia prohibits commercial harvest of shellfish in all its waters.
Florida								
Georgia		49.71			395.00		395.00	
Guam	0	0.00	0.00	0.00	0.00	0.00	0.00	Officially, there are no designated shellfish collection areas for Guam.
Hawaii	0						0.00	
Interstate Sanitation Commission								
Louisiana	26							
Maine								
Maryland	37	1,665.90	68.08	103.11	0.00		171.19	Maryland does not routinely monitor for human pathogens; fecal coliform bacteria are used as an indicator for pathogenic organisms. The State also requires a sanitary survey to check for pollution sources that show a potential for human health risks.
Massachusetts	12	2,185.89	41.54		240.48	259.72	541.74	
Mississippi								
N Mariana Islands								
New Hampshire	11	11.40	0.50	1.50	14.30	0.50	16.80	The 54 sq mi of open ocean water w/in NH are also closed for shellfishing. This is not due to elevated bacteria concentrations; rather, it is because a sanitary survey of the area has not been recently conducted in accordance with NSSP guidelines.
New Jersey		798.00	113.00		141.00		254.00	These values include both estuary/bay and ocean waters.
New York		1,562.50			312.50		312.50	
North Carolina								
Oregon	7	3.59	58.01				58.01	
Puerto Rico								
Rhode Island	39	146.08	24.06	1.94	40.45		66.45	
South Carolina	122	621.11	6.40	147.54	36.19	76.32	266.45	Waters that South Carolina listed both as prohibited due to poor water quality and management closures were reported as prohibited.

Appendix E-3. Shellfish Harvesting Restrictions due to Pathogens Reported by States, Territories, and Commissions

Jurisdiction	Number of Waterbodies with Restrictions	Approved (sq. miles)	Conditionally Approved[a] (sq. miles)	Restricted[b] (sq. miles)	Prohibited[c] (sq. miles)	Management Closures[d] (sq. miles)	Total Area Affected[e] (sq. miles)	Comment
Texas								
Virgin Islands								
Virginia			6.00		140.00		146.00	
Washington								
Total	254	7,044.18	317.59	351.09	1,319.92	336.54	2,325.14	

[a] Conditionally approved waters do not always meet criteria for harvesting shellfish, but may be harvested when criteria are met.
[b] Restricted water may be harvested if the shellfish are purified with clean water following harvest.
[c] Shellfish may not be harvested in prohibited waters.
[d] Preventative closures due to a lack of data or proximity to point sources or marinas.
[e] Includes waters that are classified as conditionally approved, restricted, prohibited, and management closures.

Appendix E-4. Sources Associated with Shellfish Harvesting Restrictions due to Pathogens

Jurisdiction	Urban Runoff/Storm Sewers		Municipal Discharges		NPS (General)		Point Sources (General)		Industrial Discharges	
	Number of Restrictions	Sq. Miles	Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles
Alabama										
Alaska										
California										
Connecticut										
Delaware										
Delaware River						97		97		
District of Columbia										
Florida										
Georgia	3	127	7	127	10	356	9	162		
Guam										
Hawaii	0	0	0	0	0	0	0	0	0	0
Interstate Sanitation Commission										
Louisiana										
Maine										
Maryland			1	1.48	33	80.27			4	9.58
Massachusetts										
Mississippi										
N Mariana Islands										
New Hampshire					11	16.8				
New Jersey		47		3						
New York										
North Carolina										
Oregon	2	25.79	6	54.42	6	54.42			5	43.48
Puerto Rico										
Rhode Island			16		25				16	
South Carolina					70	153.85	43	36.19		

Appendix E-4. Sources Associated with Shellfish Harvesting Restrictions due to Pathogens

Jurisdiction	CSOs		Septic Tanks		Marinas		Comment
	Number of Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles	
Alabama							
Alaska							
California							
Connecticut							
Delaware							
Delaware River							Sources identified using best professional judgement.
District of Columbia							The District of Columbia prohibits commercial harvest of shellfish in all its waters.
Florida							
Georgia					3	66	An additional 3 restrictions affecting 66 square miles are due to industrial nonpoint sources.
Guam							
Hawaii	0	0	0	0			
Interstate Sanitation Commission							
Louisiana							
Maine							
Maryland			2	6.44			for human pathogens; fecal coliform bacteria are used as an indicator for pathogenic organisms. The State also requires a sanitary survey to check for pollution sources that show a potential for human health risks.
Massachusetts							
Mississippi							
N Mariana Islands							
New Hampshire							The 16.8 square miles include 0.5 square miles that are classified "conditionally approved" which are open during dry weather but closed after certain rain events.
New Jersey		5				39	Values are for bay waters. New Jersey reports sources of restrictions in percentages - 30% are due to urban runoff, 2% to municipal discharges, 3% to CSOs, and 25% to marinas.
New York							
North Carolina							
Oregon			7	58.01			
Puerto Rico							
Rhode Island	5		14		18		
South Carolina							

Appendix E-4. Sources Associated with Shellfish Harvesting Restrictions due to Pathogens

Jurisdiction	Urban Runoff/Storm Sewers		Municipal Discharges		NPS (General)		Point Sources (General)		Industrial Discharges	
	Number of Restrictions	Sq. Miles	Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles
Texas										
Virgin Islands										
Virginia										
Washington										
Total	5	199.79	30	185.9	155	758.34	52	295.19	25	53.06

Appendix E-4. Sources Associated with Shellfish Harvesting Restrictions due to Pathogens

Jurisdiction	CSOs		Septic Tanks		Marinas		Comment
	Number of Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles	Number of Restrictions	Sq. Miles	
Texas							
Virgin Islands							
Virginia							
Washington							
Total	5	5	23	64.45	21	105	

Appendix E-6. Contact Recreation Restrictions Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Contact Recreation Restrictions	Number of Sites Affected	Reasons for Restriction	Comment
Agua Caliente Band				
Alabama	12	7	Fecal coliforms from sanitary sewer overflow; each restricition a one-time event.	
Alaska				
Arizona		2	Fecal coliform in Lake Havasu and Slide Rock State Park. Possible sources include wastewater disposal, natural sources, and recreation.	
Arkansas				
Augustine Band				
California	187		Rain, construction, sewage, storm runoff, urban runoff, pump failure, inadequately treated sewage, line blockage, and syringes found on beach.	
Colorado				
Connecticut				
Cortina Rancheria				
Coyote Valley Reservation	4	4	Unidentified foaming agent: MBAS tests detected extremely high concentrations one week in July. Possible dumping or septic system failtures upstream.	Swimming and fishing not recommended.
Delaware				
Delaware River	0	0		
District of Columbia				
Florida				
Georgia	1	1	Fecal coliform	
Guam	1	1	Tanguisson Beach has been closed to the public since 1991 due to toxics found in seaweed.	
Hawaii	0	0		There were no beach closures, but ten incidents required posting of beaches.
Idaho	5	5		
Illinois				
Indiana				

Appendix E-6. Contact Recreation Restrictions Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Contact Recreation Restrictions	Number of Sites Affected	Reasons for Restriction	Comment
Interstate Sanitation Commission		80	Elevated levels of bacteria, sewage spills, sewage treatment facility malfunctions, untreated sewage discharges, and floating mat of vegetation.	
Iowa	1	1	High levels of indicator bacteria (fecal coliform) at swimming beach, August 1997.	Follow-up monitoring showed (1) source of bacteria was population of Canada geese and (2) bacteria levels < EPA criteria.
Kansas				
Kentucky	3	10	Fecal coliform contamination.	
La Jolla Band of Indians	0	0		
Louisiana	8		Fecal coliform and sediment contamination	
Maine				
Manzanita Band	0	0		
Maryland	38	29	Bacteria from runoff, septic discharges, sewer overflow, recreational activities, wildlife, and other sources.	Bathing advisories from local health departments are not identified as restrictions or closures.
Massachusetts				Massachusetts does not compile monitoring data on beach data on a statewide basis.
Michigan				
Minnesota				
Mississippi				
Missouri				
Montana				
N Mariana Islands				
Nebraska	0	0		
Nevada				
New Hampshire	6	4	4 beaches in '96 and 2 in '97 were posted (but not closed) due to bacteria exceedances from Canadian geese (1 beach) and high swim loads (other 3).	
New Jersey				
New Mexico				
New York				
North Carolina				
North Dakota	0	0		
Ohio				

Appendix E-6. Contact Recreation Restrictions Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Contact Recreation Restrictions	Number of Sites Affected	Reasons for Restriction	Comment
Ohio River Valley				
Oklahoma	0			
Oregon	0	0		
Pennsylvania				
Puerto Rico				
Rhode Island	2	2	Town of Barrington closed town beach due to high fecal coliform; Town of Warwick has closed Little Pond for the last three years.	
South Carolina	27	17	Exceeded acceptable fecal coliform levels.	
South Dakota	29	38	Fecal coliform	
Tennessee	24	36	Bacteriological contamination from wastewater, stormwater, and septic tanks.	
Texas				
Torres-Martinez Desert Band				
Twenty-Nine Palms Band				
Utah				
Vermont	7	3	Heavy rains resulting in urban runoff containing pollutants, faulty septic systems, and other sources of bacteria.	
Virgin Islands				
Virginia				
Washington				
West Virginia				
Wisconsin				
Wyoming	0	0		
Yavapai-Prescott Reservation				
Total	355	240		

Appendix E-10. Sediment Contamination Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Number of Sites Assessed	Number of Sites with Toxics	Number of Sites of Concern	Contaminants Detected	Contaminants of Concern
Agua Caliente Band					
Alabama					
Alaska					
Arizona					
Arkansas					
Augustine Band					
California					
Colorado					
Connecticut					
Cortina Rancheria					
Coyote Valley Reservation	1	1	1		Non-specified household toxics
Delaware					
Delaware River					
District of Columbia	2	2		Trace metals, PAHs, and PCBs.	
Florida					
Georgia					
Guam					
Hawaii		13		Pesticides, metals (lead, arsenic)	
Idaho					
Illinois					
Indiana					
Interstate Sanitation Commission					
Iowa	19	16	0	Toxic metals, organochlorine compounds	None (Iowa does not have sediment criteria)
Kansas					
Kentucky	1	1		PCBs	
La Jolla Band of Indians					
Louisiana		3			
Maine					
Manzanita Band					
Maryland					
Massachusetts		24		Metals (As, Pb, Hg), priority organics (PCBs, PAHs, dioxin), oil and grease, pesticides.	
Michigan					
Minnesota					

Appendix E-10. Sediment Contamination Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Sources of Contaminants	Comment
Agua Caliente Band		
Alabama		
Alaska		
Arizona		
Arkansas		
Augustine Band		
California		
Colorado		
Connecticut		
Cortina Rancheria		
Coyote Valley Reservation	Dumpster above Russian River	Recycling and demonstration transfer station planned and imminent.
Delaware		
Delaware River		
District of Columbia		
Florida		
Georgia		
Guam		Guam does not currently have provisions for the collection and analyzation of sediments - an outside study should be available for review in 1998.
Hawaii		
Idaho		
Illinois		
Indiana		
Interstate Sanitation Commission		
Iowa	Natural, agriculture, unknown	Data from USGS NAWQA study and from US Army Corps of Engineers monitoring
Kansas		
Kentucky		
La Jolla Band of Indians		
Louisiana		
Maine		
Manzanita Band		
Maryland		
Massachusetts		
Michigan		
Minnesota		

Appendix E-10. Sediment Contamination Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Number of Sites Assessed	Number of Sites with Toxics	Number of Sites of Concern	Contaminants Detected	Contaminants of Concern
Mississippi		16		Priority organics, nonpriority organics, metals, unknown toxicity	
Missouri					
Montana					
N Mariana Islands					
Nebraska					
Nevada					
New Hampshire					
New Jersey					
New Mexico					
New York					PCBs and other priority organics
North Carolina					
North Dakota		1		Pesticides	
Ohio					
Ohio River Valley					
Oklahoma					
Oregon		1		Arsenic, creosote, and pentachlorophenol.	
Pennsylvania					
Puerto Rico					
Rhode Island			25		VOCs, chlorinated solvents, hydrocarbons, metals, pesticides, PCBs, and other hazardous materials
South Carolina					
South Dakota					
Tennessee		37	37	Priority organics, lead, mercury, PCBs, dioxin	Priority organics, lead, mercury, PCBs, dioxin
Texas					
Torres-Martinez Desert Band					
Twenty-Nine Palms Band					
Utah					
Vermont					
Virgin Islands					
Virginia					
Washington					
West Virginia					

Appendix E-10. Sediment Contamination Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Sources of Contaminants	Comment
Mississippi	Industrial and municipal point sources, urban runoff/storm sewers, marinas, land disposal, hazardous waste	
Missouri		
Montana		
N Mariana Islands		
Nebraska		
Nevada		
New Hampshire		New Hampshire does not currently have numeric water quality criteria for sediments.
New Jersey		
New Mexico		
New York		Refers to impairment in Hudson River and Lake Ontario.
North Carolina		
North Dakota	Suspect abandoned landfill and pesticide formulating plant	
Ohio		
Ohio River Valley		
Oklahoma		
Oregon	Superfund site	
Pennsylvania		
Puerto Rico		
Rhode Island		These are site remediation projects.
South Carolina		
South Dakota		
Tennessee	Past industrial discharges, Superfund sites, mining activities	Tally compiled from state's 1998 303(d) list.
Texas		
Torres-Martinez Desert Band		
Twenty-Nine Palms Band		
Utah		
Vermont		
Virgin Islands		
Virginia		
Washington		
West Virginia		

Appendix E-10. Sediment Contamination Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Number of Sites Assessed	Number of Sites with Toxics	Number of Sites of Concern	Contaminants Detected	Contaminants of Concern
Wisconsin					
Wyoming					
Yavapai-Prescott Reservation					
Total	23	115	63		

Appendix E-10. Sediment Contamination Reported by States, Tribes, Territories, and Commissions

Jurisdiction	Sources of Contaminants	Comment
Wisconsin		
Wyoming		
Yavapai-Prescott Reservation		
Total		

Appendix F-1. Total Miles of Great Lakes Shoreline in the Nation

Jurisdiction	Total Miles	Assessed Miles	Percent Assessed	Comment
Illinois	63	63	100%	
Indiana	43	43	100%	
Michigan	3,250	3,250	100%	
Minnesota	272	0	0%	
New York	577	577	100%	
Ohio	236	0	0%	
Pennsylvania	63	0	0%	
Wisconsin	1,017	1,017	100%	
Total	5521	4950 90%		

Appendix F-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Great Lakes Shoreline

Jurisdiction	Full Support - Evaluated	Full Support - Monitored	Full Support - Not Specified	Full Support Total	Threatened - Evaluated	Threatened - Monitored	Threatened - Not Specified	Threatened - Total	Impaired - Evaluated	Impaired - Monitored	Impaired - Not Specified	Impaired - Total
Illinois	0	0	0	0	0	63	0	63	0	0	0	0
Indiana	0	0	0	0	0	0	0	0	0	43	0	43
Michigan	0	0	0	0	0	0	0	0	0	3,250	0	3,250
Minnesota				0				0				0
New York			85	85			40	40			452	452
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	0	0	0	0	0	0	0	0	707	310	0	1,017
Total	0	0	85	85	0	63	40	103	707	3,603	452	4,762
	0%	0%	2%	2%	0%	1%	1%	2%	14%	73%	9%	96%

Appendix F-2. Summary of Fully Supporting, Threatened, and Impaired Waters in Assessed Great Lakes Shoreline

Jurisdiction	Not Attainable - Evaluated	Not Attainable - Monitored	Not Attainable - Not Specified	Not Attainable - Total	Total Evaluated	Total Monitored	Total Unspecified	Total Assessed	Comment
Illinois				0	0	63	0	63	State reported overall use support status.
Indiana	0	0	0	0	0	43	0	43	
Michigan				0	0	3,250	0	3,250	
Minnesota				0	0	0	0	0	
New York				0	0	0	577	577	
Ohio				0	0	0	0	0	
Pennsylvania				0	0	0	0	0	
Wisconsin	0	0	0	0	707	310	0	1,017	
Total	0	0	0	0	707	3,666	577	4,950	
	0%	0%	0%	0%	14%	74%	12%		

Appendix F-3a. Aquatic Life Use Support in Assessed Great Lakes Shoreline

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Illinois	0	63	0	0		63	
Indiana	43	0	0	0	0	43	
Michigan						0	
Minnesota						0	
New York	577	0	0	0		577	
Ohio						0	
Pennsylvania						0	
Wisconsin	0	807	210	0	0	1,017	
Total	620	870	210	0	0	1,700	
	36%	51%	12%	0%	0%		

Appendix F-3b. Fish Consumption Use Support in Assessed Great Lakes Shoreline

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Illinois	0	0	0	63		63	
Indiana	0	0	43	0	0	43	
Michigan	0			3,250		3,250	
Minnesota						0	
New York	203	0	374	0		577	
Ohio						0	
Pennsylvania						0	
Wisconsin	0	0	1,017	0	0	1,017	
Total	203	0	1,434	3,313	0	4,950	
	4%	0%	29%	67%	0%		

Appendix F-3c. Swimming Use Support in Assessed Great Lakes Shoreline

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Illinois	50	0	13	0		63	
Indiana	0	0	43	0	0	43	
Michigan	3,242			8		3,250	
Minnesota						0	
New York	507	34	37	0		577	
Ohio						0	
Pennsylvania						0	
Wisconsin						0	
Total	3,799	34	93	8	0	3,933	
	97%	1%	2%	0%	0%		

Appendix F-3d. Secondary Contact Use Support in Assessed Great Lakes Shoreline

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Illinois						0	
Indiana						0	
Michigan	3,250			0		3,250	
Minnesota						0	
New York	531	5	41	0		577	
Ohio						0	
Pennsylvania						0	
Wisconsin						0	
Total	3,781	5	41	0	0	3,827	
	99%	0%	1%	0%	0%		

Appendix F-3e. Drinking Water Use Support in Assessed Great Lakes Shoreline

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Illinois						0	
Indiana						0	
Michigan	3,170			80		3,250	
Minnesota						0	
New York	577	0	0	0		577	
Ohio						0	
Pennsylvania						0	
Wisconsin						0	
Total	3,747	0	0	80	0	3,827	
	98%	0%	0%	2%	0%		

Appendix F-3f. Agriculture Use Support in Assessed Great Lakes Shoreline

Jurisdiction	Full Support	Threatened	Partial Support	Not Supporting	Not Attainable	Total Assessed	Comment
Illinois						0	
Indiana						0	
Michigan	3,250			0		3,250	
Minnesota						0	
New York						0	
Ohio						0	
Pennsylvania						0	
Wisconsin						0	
Total	3,250	0	0	0	0	3,250	
	100%	0%	0%	0%	0%		

Appendix F-4. Leading Pollutants and Stressors Impairing Assessed Great Lakes Shoreline

Jurisdiction	1 - Priority Organic Chemicals				2 - Pesticides				3 - Nonpriority Organic Chemicals			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana				0				0				0
Michigan				0				0				0
Minnesota				0				0				0
New York			374	374				0				0
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	1,017	0	0	1,017	0	1,017	0	1,017	0	1,017	0	1,017
Total	1,017	0	374	1,391	0	1,017	0	1,017	0	1,017	0	1,017

Appendix F-4. Leading Pollutants and Stressors Impairing Assessed Great Lakes Shoreline

Jurisdiction	4 - Nutrients				5 - Pathogens				6 - Organic Enrichment/Low DO			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana				0	0	43	0	43				0
Michigan				0				0				0
Minnesota				0				0				0
New York			59	59			23	23				0
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	75	100	0	175	0	120	0	120	75	100	0	175
Total	75	100	59	234	0	163	23	186	75	100	0	175

Appendix F-4. Leading Pollutants and Stressors Impairing Assessed Great Lakes Shoreline

Jurisdiction	7 - Metals				8 - Siltation				9 - Noxious Aquatic Plants			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana	0	43	0	43				0				0
Michigan				0				0				0
Minnesota				0				0				0
New York				0			6	6				0
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	0	100	0	100	0	75	0	75	75	0	0	75
Total	0	143	0	143	0	75	6	81	75	0	0	75

Appendix F-4. Leading Pollutants and Stressors Impairing Assessed Great Lakes Shoreline

Jurisdiction	10 - Oil and Grease				11 - PCBs				12 - Taste and Odor			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana				0	0	43	0	43				0
Michigan				0				0				0
Minnesota				0				0				0
New York				0				0			1	1
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	0	60	0	60				0	0	40	0	40
Total	0	60	0	60	0	43	0	43	0	40	1	41

Appendix F-4. Leading Pollutants and Stressors Impairing Assessed Great Lakes Shoreline

Jurisdiction	13 - Other Habitat Alterations				14 - Unionized Ammonia				15 - Chlorine			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana				0				0				0
Michigan				0				0				0
Minnesota				0				0				0
New York				0				0				0
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	0	40	0	40	0	20	0	20	0	20	0	20
Total	0	40	0	40	0	20	0	20	0	20	0	20

Appendix F-4. Leading Pollutants and Stressors Impairing Assessed Great Lakes Shoreline

Jurisdiction	16 - Suspended Solids				Comment
	Major	Minor/Mod	Not Specified	Total	
Illinois				0	Illinois reports 63 miles threatened by priority organics (PCBs, chlordane) based on a fish health advisory.
Indiana				0	
Michigan				0	
Minnesota				0	
New York				0	
Ohio				0	
Pennsylvania				0	
Wisconsin	0	20	0	20	
Total	0	20	0	20	

Appendix F-5. Leading Sources Impairing Assessed Great Lakes Shoreline

Jurisdiction	1 - Atmospheric Deposition				2 - Other (Discontinued Discharges)				3 - Contaminated Sediments			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana				0				0				0
Michigan				0				0				0
Minnesota				0				0				0
New York				0				0			374	374
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	0	1,017	0	1,017	1,017	0	0	1,017	310	0	0	310
Total	0	1,017	0	1,017	1,017	0	0	1,017	310	0	374	684

Appendix F-5. Leading Sources Impairing Assessed Great Lakes Shoreline

Jurisdiction	4 - Industrial Point Sources				5 - Urban Runoff/Storm Sewers				6 - Agriculture			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana				0				0				0
Michigan				0				0				0
Minnesota				0				0				0
New York				0			14	14			13	13
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	0	140	0	140	0	120	0	120	0	120	0	120
Total	0	140	0	140	0	120	14	134	0	120	13	133

Appendix F-5. Leading Sources Impairing Assessed Great Lakes Shoreline

Jurisdiction	7 - Municipal Point Sources				8 - Combined Sewer Overflow				9 - Land Disposal			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana				0				0				0
Michigan				0				0				0
Minnesota				0				0				0
New York				0			22	22			33	33
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin	0	120	0	120	0	80	0	80	0	60	0	60
Total	0	120	0	120	0	80	22	102	0	60	33	93

Appendix F-5. Leading Sources Impairing Assessed Great Lakes Shoreline

Jurisdiction	10 - Source Unknown				11 - Spills				12 - Onsite Wastewater Systems			
	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total	Major	Minor/Mod	Not Specified	Total
Illinois				0				0				0
Indiana	0	43	0	43				0				0
Michigan				0				0				0
Minnesota				0				0				0
New York			1	1				0			33	33
Ohio				0				0				0
Pennsylvania				0				0				0
Wisconsin				0	0	40	0	40	0	0	0	0
Total	0	43	1	44	0	40	0	40	0	0	33	33

Appendix F-5. Leading Sources Impairing Assessed Great Lakes Shoreline

	13 - Ground Water Loadings				14 - Construction				Comment
Jurisdiction	**Major**	**Minor/Mod**	**Not Specified**	**Total**	**Major**	**Minor/Mod**	**Not Specified**	**Total**	
Illinois				0				0	Illinois reports that industrial point sources threaten 16 miles of shoreline, CSOs threaten10 miles, urban runoff threatens 63 miles, atmospheric depositon threatens 63 miles, and contaminated sediments threaten 63 miles.
Indiana				0				0	
Michigan				0				0	
Minnesota				0				0	
New York				0			6	6	
Ohio				0				0	
Pennsylvania				0				0	
Wisconsin	0	20	0	20	0	0	0	0	"Other" refers to discontinued discharges. "Groundwater loading" refers to contaminated groundwater.
Total	0	20	0	20	0	0	6	6	

Appendix G-1. Summary of State Bioassessment Programs (includes 50 States, the Ohio River Valley Sanitation Commission, and District of Columbia)

State Capability	Number of States with Program in Place	Number of States with Program Under Development	Number of States Without Program
Use of Bioassessments			
Water Resource Management (Nonregulatory)	41	8	3
Interpret Aquatic Life Use Attainment	31	8	13
Narrative Water Quality Standard	29	11	12
Numeric Water Quality Standard	2	15	35
Organism Group Used			
Fish	29	5	18
Benthic Macroinvertebrates	44	5	3
Algae (Periphyton, Diatoms)	4	3	45
Reference Conditions			
Ecoregional	15	26	11
Site-specific	31	0	21
Statewide, or Basin-specific	6	0	46
Using Multiple Metrics for Data Analysis			
Biology	42	6	4
Habitat	33	6	13

Source: U.S. EPA Office of Policy, Planning, and Evaluation.

Appendix H-1. Trophic Status of Assessed Significant Publicly Owned Lakes

Jurisdiction	Assessed		Oligotrophic		Mesotrophic		Eutrophic		HyperEutrophic	
	Number of Significant Pubic Lakes	**Acreage of Significant Pubic Lakes**	**Number of Significant Pubic Lakes**	**Acreage of Significant Pubic Lakes**	**Number of Significant Pubic Lakes**	**Acreage of Significant Pubic Lakes**	**Number of Significant Pubic Lakes**	**Acreage of Significant Pubic Lakes**	**Number of Significant Pubic Lakes**	**Acreage of Significant Pubic Lakes**
Alabama	33	276,436	3	585	8	54,077	21	210,539	1	11,235
Alaska										
Arizona	11		0		3		8			
Arkansas										
California										
Colorado	38	47,530	7	5,272	14	15,722	13	15,957	4	10,579
Connecticut										
Cortina Rancheria										
Delaware										
District of Columbia										
Florida	262	1,571	191	604	51	802	13	71	7	94
Georgia										
Hawaii										
Idaho										
Illinois	329	157,408	6	180	30	3,912	159	79,398	134	73,918
Indiana	164	54,153	42	4,761	62	37,389	41	10,205	19	1,798
Iowa	115	41,190					115	41,190		
Kansas	240	123,632	3	140	36	22,052	129	98,521	64	2,919
Kentucky	105	217,480	15	72,143	33	42,972	54	102,237	3	128
Louisiana										
Maine										
Manzanita Band										
Maryland	58	21,010	0	0	16	15,172	42	5,838	0	0
Massachusetts	593	64,688	8	25,790	150	17,057	380	18,912	54	2,892
Michigan	730	491,931	115	172,591	375	175,307	207	124,881	33	19,152
Minnesota	1,984	2,131,026	309	210,108	723	1,099,929	667	645,241	285	175,748
Mississippi										
Missouri	145		8		37		89		11	
Montana	177	797,184	49	289,569	71	425,599	46	81,495	1	500
Nebraska	81	121,610	2	1,601	3	3,023	29	94,393	47	22,593
Nevada	17	319,946	3	133,230	12	133,116	2	53,600		
New Hampshire	671	155,773	199	115,924	315	31,672	157	8,177		
New Jersey	116	10,462			3	111	113	10,351		
New Mexico										

Appendix H-1. Trophic Status of Assessed Significant Publicly Owned Lakes

Jurisdiction	Dystrophic		Comment
	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	
Alabama	0	0	
Alaska			
Arizona			
Arkansas			All of the state's significant publicly owned lakes are ranked based on a combination of total phosphorus, secchi visibility, and chlorophyll a value of each lake.
California			
Colorado			
Connecticut			
Cortina Rancheria			
Delaware			
District of Columbia			
Florida			
Georgia			
Hawaii			
Idaho			
Illinois			
Indiana	0	0	
Iowa			All Iowa lakes are relatively shallow and highly productive, and all can be considered eutrophic.
Kansas	0	0	Kansas assessed an additional 8 lakes (50,018 acres) with extreme turbidity conditions and 67 lakes (7,687 lakes) with unknown trophic status.
Kentucky	0	0	
Louisiana			
Maine			
Manzanita Band			
Maryland	0	0	Lakes assessed as having a split trophic condition are included in the higher trophic category. Source: MD Lake Water Quality Assessment Report, 1997.
Massachusetts	1	37	Includes Quabbin Reservoir (25,000 acres).
Michigan			
Minnesota	0	0	
Mississippi			
Missouri			
Montana	10	22	
Nebraska			
Nevada			Nevada also assessed an additional 2 lakes (960 acres) for which trophic status was not determined.
New Hampshire			
New Jersey			
New Mexico			

Appendix H-1. Trophic Status of Assessed Significant Publicly Owned Lakes

Jurisdiction	Assessed		Oligotrophic		Mesotrophic		Eutrophic		HyperEutrophic	
	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes
New York										
North Carolina	161	311,236	44	103,130	29	75,898	70	112,820	4	404
North Dakota	124	617,330	0	0	20	503,386	49	19,152	55	94,792
Ohio										
Oklahoma	199	624,343	14	10,568	69	105,325	77	342,706	39	165,744
Oregon	201	491,255	58	35,280	72	75,212	60	191,310	11	189,453
Pennsylvania	66	76,122			13	6,268	39	44,630	14	25,224
Puerto Rico	18		3		3		12			
Rhode Island	62	7,307	21	1,900	28	4,089	10	1,199	2	99
South Carolina	27	452,654			14	247,414	13	205,240		
South Dakota	112	132,159	2	1,199	10	23,205	37	30,526	63	77,229
Tennessee	122	538,438	21	100,346	38	320,408	39	73,338	24	44,346
Texas										
Torres-Martinez Desert Band										
Utah	129	460,561	47	285,154	57	59,191	24	116,166	1	50
Vermont	202	42,299	33	9,817	121	25,404	30	6,205	2	473
Virginia										
Washington										
West Virginia	81	21,423	17	7,724	31	5,335	33	8,365		
Wisconsin										
Wyoming										
Total	7,373	8,808,157	1,220	1,587,615	2,447	3,529,046	2,778	2,752,663	878	919,371

Appendix H-1. Trophic Status of Assessed Significant Publicly Owned Lakes

Jurisdiction	Dystrophic		Comment
	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	
New York			
North Carolina	14	18,984	
North Dakota			
Ohio			
Oklahoma	0	0	Oklahoma also assessed an additional 2 lakes (6,019 acres) for which trophic status was unknown (silt dominated).
Oregon	0	0	"Oligotrophic" includes 12 lakes (8,752 acres) classified as "ultra-oligotrophic."
Pennsylvania			Pennsylvania rates lakes as oligotrophic/mesotrophic because no immediate nutrient control action is needed on such lakes.
Puerto Rico			
Rhode Island	1	20	Oligotrophic includes lakes classified as oligo/meso and meso/oligo; mesotrophic includes lakes classified as meso/eutrophic. Rhode Island also surveyed an additional 4 lakes (366 acres) for which trophic status was not determined.
South Carolina			South Carolina reported the number and acreage of lakes as either oligotrophic/mesotrophic or eutrophic/hypereutrophic. The state also surveyed an additional 19 lakes (23,473 acres) for which trophic status was unknown.
South Dakota	0	0	
Tennessee			This information is from the state's 1996 305(b) report, but is still considered to reflect current conditions.
Texas			
Torres-Martinez Desert Band			
Utah			
Vermont	16	400	
Virginia			
Washington			
West Virginia			
Wisconsin			
Wyoming			
Total	42	19,463	

Table H-2. Acidity in Assessed Significant Publicly Owned Lakes

Jurisdiction	Number of Lakes Assessed for Acid Sensitivity	Lake Acres Assessed for Acid Sensitivity	Number of Lakes Exhibiting Sensitivity	Lake Acres Exhibiting Sensitivity	Number of Lakes Threatened by Acidity	Lake Acres Threatened by Acidity	Comment
Alabama	39	485,046	1	1,850	6	32,930	
Alaska							
Arizona							
Arkansas							
California							
Colorado			1	300			
Connecticut							
Cortina Rancheria							
Delaware							
District of Columbia							
Florida							
Georgia							
Hawaii							
Idaho							
Illinois	306	157,408	0	0			
Indiana							
Iowa	20	4,799	0	0	0	0	Data from 1992-1995. No monitoring during 1996-1997.
Kansas	307	181,337	7	43	200	1,500	The 200 threatened lakes are in a mined land area and are not included in the total number surveyed.
Kentucky	2	354	2	354	0	0	
Louisiana							
Maine							
Manzanita Band							
Maryland	58	21,010	0	0	1	20	Source: MD Lake Water Quality Assessment Report, 1997.
Massachusetts							
Michigan			5	755			
Minnesota	1,103	878,580	0	0	191	52,864	Minnesota notes that 191 lakes (52,864 acres) are at risk for acidity because they have a naturally low buffering capacity.
Mississippi							
Missouri							
Montana	200	1,000			1	75	Based on study by US Forest Service.
Nebraska	81	121,610	0	0	0	0	
Nevada							
New Hampshire	687	156,036	50	2,167			
New Jersey							
New Mexico							
New York			424	50,276			
North Carolina							
North Dakota							
Ohio							
Oklahoma	22	57,315	10	23,163	12	34,152	
Oregon	42		0		113		
Pennsylvania							

Table H-2. Acidity in Assessed Significant Publicly Owned Lakes

Jurisdiction	Number of Lakes Assessed for Acid Sensitivity	Lake Acres Assessed for Acid Sensitivity	Number of Lakes Exhibiting Sensitivity	Lake Acres Exhibiting Sensitivity	Number of Lakes Threatened by Acidity	Lake Acres Threatened by Acidity	Comment
Puerto Rico							
Rhode Island	84	9,718	1	26	23	2,524	
South Carolina	40	474,651	2	420			
South Dakota	112	132,159	0	0	0	0	
Tennessee	121	537,261	5	575			
Texas							
Torres-Martinez Desert Band							
Utah							
Vermont							
Virginia							
Washington							
West Virginia	93	21,523	2	61	5	7,405	
Wisconsin							
Wyoming							
Total	3,317	3,239,806	510	79,990	552	131,470	

Appendix H-3. Source of Acidity in Assessed Significant Publicly Owned Lakes

Jurisdiction	Acid Deposition				Acid Mine Drainage			
	Number of Lakes Impacted	Lake Acres Impacted	Number of Lakes Threatened	Lakes Acres Threatened	Number of Lakes Impacted	Lake Acres Impacted	Number of Lakes Threatened	Lakes Acres Threatened
Alabama	0	0			1	1,850		
Alaska								
Arizona								
Arkansas								
California								
Colorado					1	300		
Connecticut								
Cortina Rancheria								
Delaware								
District of Columbia								
Florida								
Georgia								
Hawaii								
Idaho								
Illinois	0	0			0	0		
Indiana								
Iowa	0	0	0	0	0	0	0	0
Kansas	0	0			7	43	200	1,500
Kentucky	0	0	0	0	2	354	0	0
Louisiana								
Maine								
Manzanita Band								
Maryland			1	20				
Massachusetts								
Michigan								
Minnesota								
Mississippi								
Missouri								
Montana					1	75		
Nebraska								
Nevada								
New Hampshire	23	1,007						
New Jersey								
New Mexico								
New York								
North Carolina								
North Dakota								
Ohio								
Oklahoma	0	0			21	57,167		
Oregon	0	0			0	0		

Appendix H-3. Source of Acidity in Assessed Significant Publicly Owned Lakes

Jurisdiction	Natural Condition				Other				Comment
	Number of Lakes Impacted	Lake Acres Impacted	Number of Lakes Threatened	Lakes Acres Threatened	Number of Lakes Impacted	Lake Acres Impacted	Number of Lakes Threatened	Lakes Acres Threatened	
Alabama	0	0			0	0			
Alaska									
Arizona									
Arkansas									
California									
Colorado									
Connecticut									
Cortina Rancheria									
Delaware									
District of Columbia									
Florida									
Georgia									
Hawaii									
Idaho									
Illinois	0	0			0	0			
Indiana									
Iowa	0	0	0	0	0	0	0	0	
Kansas	0	0			0	0			The 200 threatened lakes are in a mined land area.
Kentucky	0	0	0	0	0	0	0	0	
Louisiana									
Maine									
Manzanita Band									
Maryland									Source: MD Lake Water Quality Assessment Report, 1997.
Massachusetts									
Michigan									
Minnesota									
Mississippi									
Missouri									
Montana									Based on study by US Forest Service.
Nebraska									Nebraska does not have a lake acidity problem.
Nevada									
New Hampshire	27	1,160							
New Jersey									
New Mexico									
New York									
North Carolina									
North Dakota									
Ohio									
Oklahoma	1	148			0	0			
Oregon	0	0			0	0			

Appendix H-3. Source of Acidity in Assessed Significant Publicly Owned Lakes

	Acid Deposition				Acid Mine Drainage			
Jurisdiction	Number of Lakes Impacted	Lake Acres Impacted	Number of Lakes Threatened	Lakes Acres Threatened	Number of Lakes Impacted	Lake Acres Impacted	Number of Lakes Threatened	Lakes Acres Threatened
Pennsylvania								
Puerto Rico								
Rhode Island								
South Carolina								
South Dakota	0	0	0	0	0	0	0	0
Tennessee					5	575		
Texas								
Torres-Martinez Desert Band								
Utah								
Vermont								
Virginia								
Washington								
West Virginia								
Wisconsin								
Wyoming								
Total	23	1,007	1	20	38	60,364	200	1,500

Appendix H-3. Source of Acidity in Assessed Significant Publicly Owned Lakes

Jurisdiction	Natural Condition				Other				Comment
	Number of Lakes Impacted	Lake Acres Impacted	Number of Lakes Threatened	Lakes Acres Threatened	Number of Lakes Impacted	Lake Acres Impacted	Number of Lakes Threatened	Lakes Acres Threatened	
Pennsylvania									
Puerto Rico									
Rhode Island									
South Carolina	2	420							The watersheds of these clear blackwater lakes contain extensive cypress swamps.
South Dakota	0	0	0	0	0	0	0	0	
Tennessee									
Texas									
Torres-Martinez Desert Band									
Utah									
Vermont									
Virginia									
Washington									
West Virginia									
Wisconsin									
Wyoming									
Total	30	1,728	0	0	0	0	0	0	

Appendix H-4. Trends in Assessed Significant Publicly Owned Lakes

Jurisdiction	Assessed		Improving		Stable		Degrading		Comment
	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	
Alabama	33	232,871	1	2,300	26	179,363	6	51,208	Alabama also reported an additional 12 lakes (231,140 acres) as having unknown trend.
Alaska									
Arizona									
Arkansas									
California									
Colorado									
Connecticut									
Cortina Rancheria									
Delaware									
District of Columbia									
Florida	202	927,488	46	184,320	113	625,792	43	117,376	
Georgia									
Hawaii									
Idaho									
Illinois	175	94,111	18	22,986	21	6,735	31	16,982	Illinois reported 105 lakes totaling 47,408 acres as fluctuating in trend.
Indiana	109	50,979	15	8,474	72	22,569	22	19,936	Indiana also reported an additional 55 lakes (3,174 acres) as having an unknown trend.
Iowa	114	41,176	13	3,981	90	35,831	11	1,364	Water quality trends are based primarily on professional judgement of Iowa DNR staff.
Kansas	122	168,434	7	7,497	84	123,554	31	37,383	Trends based on change in trophic status. Kansas also reported an additional 185 lakes (12,903 acres) for which trend was not determined.
Kentucky	17	5,835	4	327	13	5,508			Kentucky has a basin-watershed approach. All lakes will be sampled every 5 years.
Louisiana									
Maine									
Manzanita Band									
Maryland									
Massachusetts									
Michigan									
Minnesota	303		121		166		16		Data from lakes in the citizen monitoring program in 1997. Trends were done for lakes with at least 9 years of data and at least 4 readings per summer.
Mississippi									
Missouri									
Montana	1						1	126,000	Flathead Lake is the only lake for which trend data are available.
Nebraska									
Nevada	17	319,946	0	0	17	319,946	0	0	
New Hampshire	102	35,190	20	8,968	63	23,088	19	3,134	Based on short-term trends in trophic status.
New Jersey									
New Mexico									
New York									

Appendix H-4. Trends in Assessed Significant Publicly Owned Lakes

Jurisdiction	Assessed		Improving		Stable		Degrading		Comment
	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	Number of Significant Pubic Lakes	Acreage of Significant Pubic Lakes	
North Carolina									
North Dakota	16	473,612	2	74,824	10	392,723	4	6,066	Trends based on change in trophic status.
Ohio									
Oklahoma									
Oregon	12	6,443	4	2,208	5	690	3	3,545	
Pennsylvania									
Puerto Rico	18	7,343	11	5,060	7	2,283	0	0	Puerto Rico reported trends in several parameters. Trends in phosphorus data are presented in this table.
Rhode Island	49	6,531	12	2,073	29	2,951	8	1,508	Rhode Island also reported an additional 15 lakes (662 acres) for which trend was not determined.
South Carolina	38	473,160	12	250,740	24	197,310	2	25,110	Trends based on change in trophic status.
South Dakota	106	126,222	54	53,808	22	28,537	30	43,877	South Dakota also reported an additional 6 lakes (5,937 acres) as having unknown trend.
Tennessee									
Texas									
Torres-Martinez Desert Band									
Utah									
Vermont									
Virginia									
Washington									
West Virginia	11	15,195	4	6,900	7	8,295	0	0	
Wisconsin									
Wyoming									
Total	1,445	2,984,537	344	634,465	769	1,975,174	227	453,490	

Appendix H-5. 1996-1997 Clean Lakes Program Projects

Jurisdiction	Phase 1 Projects		Phase 2 Projects		Phase 3 Projects		LWQA Annual Grants		Comment
	Number of Ongoing Projects	Number of Projects Completed	Number of Ongoing Projects	Number of Projects Completed	Number of Ongoing Projects	Number of Projects Completed	Number of Ongoing Projects	Number of Projects Completed	
Alabama	5								
Alaska									
Arizona	0	0							
Arkansas									
California									
Colorado	0	0	0	0	0	0	0	0	
Connecticut									
Cortina Rancheria									
Delaware									
District of Columbia									
Florida									
Georgia	4	0	0	0	0	0	0	0	
Hawaii									
Idaho									
Illinois									
Indiana									
Iowa	0	0	1	2	0	0	0	0	
Kansas	0	0	0	0	0	0	0	0	
Kentucky	0	0	0	0	0	0	0	0	
Louisiana									
Maine									
Manzanita Band									
Maryland	0	1	0	1	0	0	0	0	Source: MD Lake Water Quality Assessment Report, 1997.
Massachusetts									
Michigan	1	1	2	3	1	1			
Minnesota	2	5	2	0	0	1			
Mississippi									
Missouri									
Montana									
Nebraska		2		2					
Nevada									
New Hampshire									
New Jersey							0	0	
New Mexico									
New York									
North Carolina									
North Dakota									
Ohio									
Oklahoma									
Oregon	0	0	0	0	0	0	0	0	
Pennsylvania	2	2	2	0			1	1	
Puerto Rico									
Rhode Island	0	2	0	0	0	0	0	4	
South Carolina	1	0	1	0	1	0	2	1	

Appendix H-5. 1996-1997 Clean Lakes Program Projects

Jurisdiction	Phase 1 Projects		Phase 2 Projects		Phase 3 Projects		LWQA Annual Grants		Comment
	Number of Ongoing Projects	Number of Projects Completed	Number of Ongoing Projects	Number of Projects Completed	Number of Ongoing Projects	Number of Projects Completed	Number of Ongoing Projects	Number of Projects Completed	
South Dakota									All Clean Lakes program projects in South Dakota have been completed.
Tennessee									
Texas									
Torres-Martinez Desert Band									
Utah	6	0	1	0	0	0	1	0	
Vermont									
Virginia									
Washington									
West Virginia	0	4	0	2	0	0	0	4	Includes projects for both the 1996 and 1998 cycles.
Wisconsin									
Wyoming									
Total	21	17	9	10	2	2	4	10	