Section I

National Summary of Water Quality Conditions

The Quality of Our Nation's Water

Introduction

The contents of this section summarize the information contained in the *National Water Quality Inventory: 1994 Report to Congress*. The National Water Quality Inventory Report to Congress is the primary vehicle for informing Congress and the public about general water quality conditions in the United States. This document characterizes our water quality, identifies widespread water quality problems of national significance, and describes various programs implemented to restore and protect our waters.

The National Water Quality Inventory Report to Congress summarizes the water quality information submitted by 61 States, American Indian Tribes, Territories, Interstate Water Commissions, and the District of Columbia (hereafter referred to as States, Tribes, and other jurisdictions) in their 1994 water quality assessment reports. As such, the report identifies water quality issues of concern to the States, Tribes, and other jurisdictions, not just the issues of concern to the U.S. Environmental Protection Agency (EPA). Section 305(b) of the Clean Water Act (CWA) requires that the States and other participating jurisdictions submit water quality assessment reports every 2 years. Most of the survey information in the 1994 Section 305(b) reports is based on water quality information collected and evaluated by the States, Tribes, and other jurisdictions during 1992 and 1993.

It is important to note that this report is based on information submitted by States, Tribes, and other jurisdictions that do not use identical survey methods and criteria to rate their water quality. The States, Tribes, and other jurisdictions favor flexibility in the 305(b) process to accommodate natural variability in their waters, but there is a trade-off between flexibility and consistency. Without known and consistent survey methods in place, EPA must use caution in comparing data or determining the accuracy of data submitted by different States and jurisdictions. Also, EPA must use caution when comparing water quality information submitted during different 305(b) reporting periods because States and other jurisdictions may modify their criteria or survey different waterbodies every 2 years.

For over 10 years, EPA has pursued a balance between flexibility and consistency in the Section 305(b) process. Recent actions by EPA, the States, Tribes, and other jurisdictions include implementing the recommendations of the National 305(b) Consistency Workgroup and the Intergovernmental Task Force on Monitoring Water Quality. These actions will enable States and other jurisdictions to share data across political boundaries as they develop watershed protection strategies.

EPA recognizes that national initiatives alone cannot clean up our waters; water quality protection and restoration must happen at the local watershed level, in conjunction with State, Tribal, and Federal activities. Similarly, this document alone cannot provide the detailed information needed to manage water quality at all levels. This document should be used together with the individual Section 305(b) reports (see the inside back cover for information on obtaining the State and Tribal Section 305(b) reports), watershed management plans, and other local documents to develop integrated water quality management options.

Paul Goetz, Cary, NC

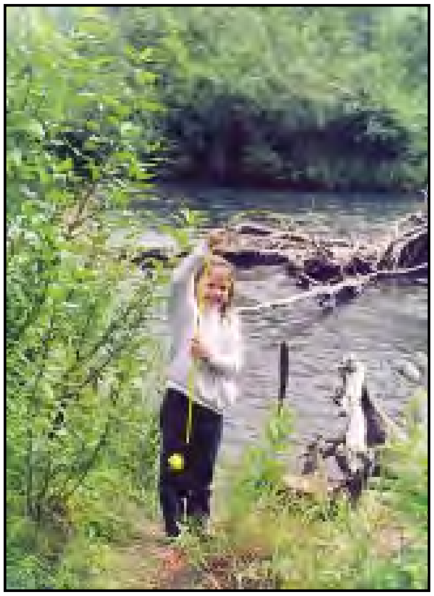
Key Concepts

Measuring Water Quality

The States, participating Tribes, and other jurisdictions survey the quality of their waters by determining if their waters attain the water quality standards they established. Water quality standards consist of beneficial uses, numeric and narrative criteria for supporting each use, and an antidegradation statement:

■ **Designated beneficial uses** are the desirable uses that water quality should support. Examples are drinking water supply, primary contact recreation (such as swimming), and aquatic life support. Each designated use has a unique set of water quality requirements or criteria that must be met for the use to be realized. States, Tribes, and other jurisdictions may designate an individual waterbody for multiple beneficial uses.

■ **Numeric water quality criteria** establish the minimum physical, chemical, and biological parameters required to support a beneficial use. Physical and chemical numeric criteria may set maximum concentrations of pollutants, acceptable ranges of physical parameters, and minimum concentrations of desirable parameters, such as dissolved oxygen. Numeric biological criteria describe the expected attainable community attributes and establish values based on measures such as species richness, presence or absence of indicator taxa, and distribution of classes of organisms.



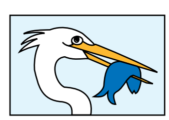
Barry Burgan, U.S. EPA

■ **Narrative water quality criteria** define, rather than quantify, conditions and attainable goals that must be maintained to support a designated use. Narrative biological criteria establish a positive statement about aquatic community characteristics expected to occur within a waterbody. For example, “Ambient water quality shall be sufficient to support life stages of all native aquatic species.” Narrative criteria may also describe conditions that are desired in a waterbody, such as “Waters must be free of substances that are toxic to humans, aquatic life, and wildlife.”

■ **Antidegradation statements**, where possible, protect existing uses and prevent waterbodies from deteriorating, even if their water quality is better than the fishable and swimmable water quality goals of the Act.

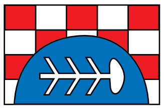
The CWA allows States, Tribes, and other jurisdictions to set their own standards but requires that all beneficial uses and their criteria comply with the goals of the Act. At a minimum, beneficial uses must provide for “the protection and propagation of fish, shellfish, and wildlife” and provide for “recreation in and on the water” (i.e., the fishable and swimmable goals of the Act), where attainable. The Act prohibits States and other jurisdictions from designating waste transport or waste assimilation as a beneficial use, as some States did prior to 1972.

Section 305(b) of the CWA requires that the States biennially survey 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 the surveying of waterbodies for support of the following individual beneficial uses:



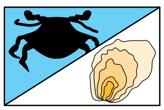
Aquatic Life Support

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



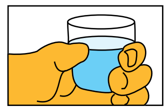
Fish Consumption

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



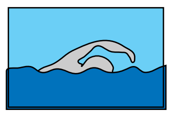
Shellfish Harvesting

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



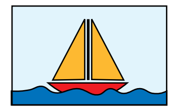
Drinking Water Supply

The waterbody can supply safe drinking water with conventional treatment.



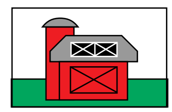
Primary Contact Recreation – Swimming

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

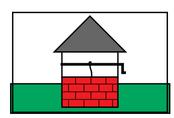
People can perform activities on the water (such as boating) without risk of adverse human health effects from ingestion or contact with the water.



Agriculture

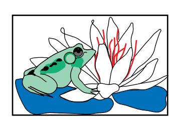
The water quality is suitable for irrigating fields or watering livestock.

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 beneficial 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.

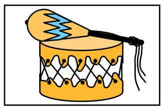
Tribes may designate their waters for special cultural and ceremonial uses:

Water Quality Monitoring

Water quality monitoring consists of data collection and sample analysis performed using accepted protocols and quality control procedures. Monitoring also includes subsequent analysis of the body of data to support decisionmaking. Federal, Interstate, State, Territorial, Tribal, Regional, and local agencies, industry, and volunteer groups with approved quality assurance programs monitor a combination of chemical, physical, and biological water quality parameters throughout the country.

- Chemical data often measure concentrations of pollutants and other chemical conditions that influence aquatic life, such as pH (i.e., acidity) and dissolved oxygen concentrations. The chemical data may be analyzed in water samples, fish tissue samples, or sediment samples.
- Physical data include measurements of temperature, turbidity (i.e., light penetration through the water column), and solids in the water column.
- Biological data measure the health of aquatic communities. Biological data include counts of aquatic species that indicate healthy ecological conditions.
- Habitat and ancillary data (such as land use data) help interpret the above monitoring information.

Monitoring agencies vary parameters, sampling frequency, and sampling site selection to meet program objectives and funding constraints. Sampling may occur at regular intervals (such as monthly, quarterly, or annually), irregular intervals, or during one-time intensive surveys. Sampling may be conducted at fixed sampling stations, randomly selected stations, stations near suspected water quality problems, or stations in pristine waters.

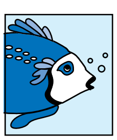


Culture

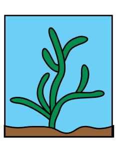
Water quality supports the waterbody's role in Tribal culture and preserves the waterbody's religious, ceremonial, or subsistence significance.

The States, Tribes, and other jurisdictions assign one of five levels of use support categories to each of their waterbodies (Table 1). If possible, the States, Tribes, and other jurisdictions determine the level of use support by comparing monitoring data with numeric criteria for 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. Monitored assessments are based on monitoring data. Evaluated assessments are based on qualitative information or monitored information more than 5 years old.

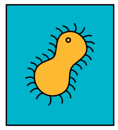
For waterbodies with more than one designated use, the States, Tribes, and other jurisdictions consolidate the individual use support information into a single overall use support determination:



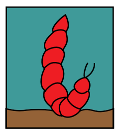
Good/Fully Supporting Overall Use – All designated beneficial uses are fully supported.



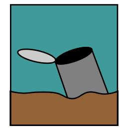
Good/Threatened Overall Use – One or more designated beneficial uses are threatened and the remaining uses are fully supported.



Fair/Partially Supporting Overall Use – One or more designated beneficial uses are partially supported and the remaining uses are fully supported or threatened. These waterbodies are considered impaired.

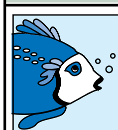
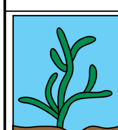
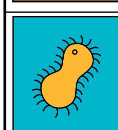
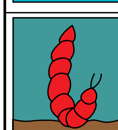
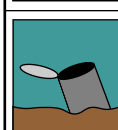


Poor/Not Supporting Overall Use – One or more designated beneficial uses are not supported. These waterbodies are considered impaired.



Poor/Not Attainable – The State, Tribe, or other jurisdiction has performed a use-attainability analysis and demonstrated that use support of one or more designated beneficial uses is not attainable due to one of six biological, chemical, physical, or economic/social conditions specified in the *Code of Federal Regulations* (40 CFR Section 131.10). These conditions include naturally high concentrations of pollutants (such as metals); other natural physical features that create unsuitable

Table 1. Levels of Use Support

Symbol	Use Support Level	Water Quality Condition	Definition
	**Fully Supporting**	**Good**	Water quality meets designated use criteria.
	**Threatened**	**Good**	Water quality supports beneficial uses now but may not in the future unless action is taken.
	**Partially Supporting**	**Fair** (Impaired)	Water quality fails to meet designated use criteria at times.
	**Not Supporting**	**Poor** (Impaired)	Water quality frequently fails to meet designated use criteria.
	**Not Attainable**	**Poor**	The State, Tribe, or other jurisdiction has performed a use-attainability analysis and demonstrated that use support is not attainable due to one of six biological, chemical, physical, or economic/social conditions specified in the *Code of Federal Regulations.*

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; and poor water quality that cannot be improved without imposing more stringent controls than those required in the CWA, which would result in widespread economic and social impacts.

- **Impaired Waters** – The sum of waterbodies partially supporting uses and not supporting uses.

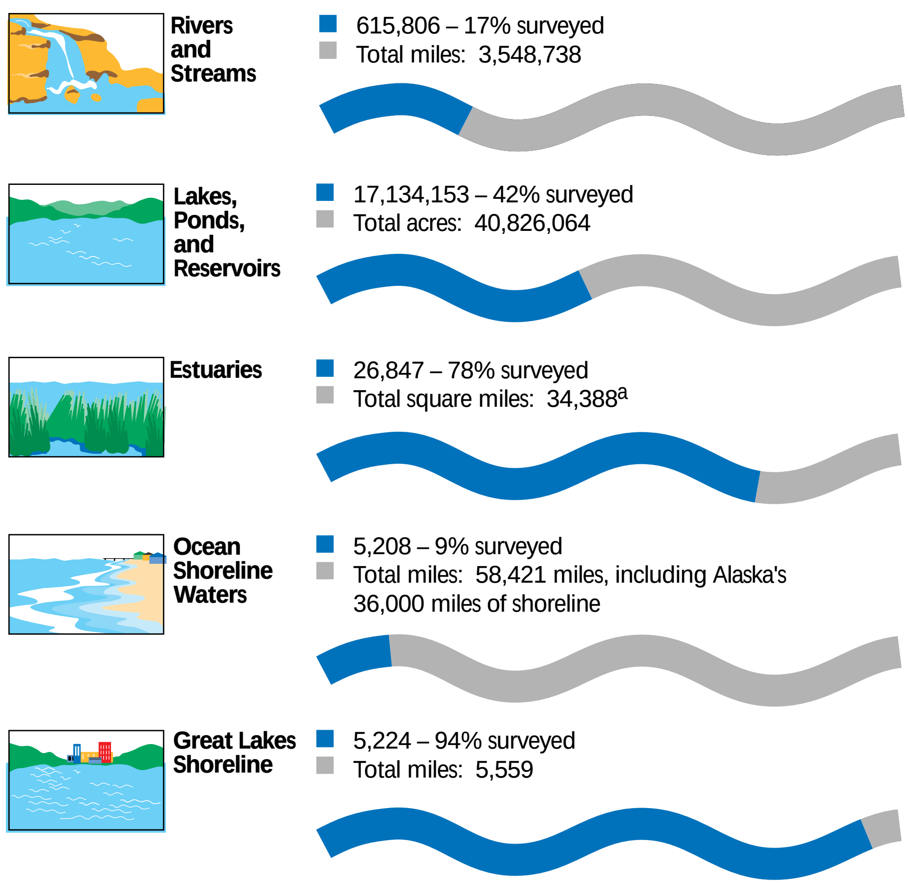
The EPA then aggregates the use support information submitted by the States, Tribes, and other jurisdictions into a national assessment of the Nation's water quality.

How Many of Our Waters Were Surveyed for 1994?

National estimates of the total waters of our country provide the foundation for determining the percentage of waters surveyed by the States, Tribes, and other jurisdictions and the portion impaired by pollution. For the 1992 reporting period, EPA provided the States with estimates of total river miles and lake acres derived from the EPA Reach File, a database containing traces of waterbodies adapted from 1:100,000 scale maps prepared by the U.S. Geological Survey. The States modified these total water estimates where necessary. Based on the 1992 EPA/State figures, the national estimate of total river miles doubled in large part because the EPA/State estimates included nonperennial streams, canals, and ditches that were previously excluded from estimates of total stream miles.

Estimates for the 1994 reporting cycle are a minor refinement of the 1992 figures and indicate that the United States has:

Figure 1. Percentage of Total Waters Surveyed for the 1994 Report



Source: 1994 Section 305(b) reports submitted by the States, Tribes, Territories, and Commissions.

[a]Excluding estuarine waters in Alaska because no estimate was available.

- More than 3.5 million miles of rivers and streams, which range in size from the Mississippi River to small streams that flow only when wet weather conditions exist (i.e., nonperennial streams)
- Approximately 40.8 million acres of lakes, ponds, and reservoirs
- About 34,388 square miles of estuaries (excluding Alaska)
- More than 58,000 miles of ocean shoreline, including 36,000 miles in Alaska
- 5,559 miles of Great Lakes shoreline
- More than 277 million acres of wetlands such as marshes, swamps, bogs, and fens, including 170 million acres of wetlands in Alaska.

The Intergovernmental Task Force on Monitoring Water Quality

In 1992, the Intergovernmental Task Force on Monitoring Water Quality (ITFM) convened to prepare a strategy for improving water quality monitoring nationwide. The ITFM is a Federal/State partnership of 10 Federal agencies, 9 State and Interstate agencies, and 1 American Indian Tribe. The EPA chairs the ITFM with the USGS as vice chair and Executive Secretariat as part of their Water Information Coordination Program pursuant to OMB memo 92-01.

The mission of the ITFM is to develop and aid implementation of a national strategic plan to achieve effective collection, interpretation, and presentation of water quality data and to improve the availability of existing information for decisionmaking at all levels of government and the private sector. A permanent successor to the ITFM, the National Monitoring Council will provide guidelines and support for institutional collaboration, comparable field and laboratory methods, quality assurance/quality control, environmental indicators, data management and sharing, ancillary data, interpretation and techniques, and training.

The ITFM and its successor, the National Monitoring Council, are also producing products that can be used by monitoring programs nationwide, such as an outline for a recommended monitoring program, environmental indicator selection criteria, and a matrix of indicators to support assessment of State and Tribal designated uses.

For a copy of the first, second, and final ITFM reports, contact:

The U.S. Geological Survey
417 National Center
Reston, VA 22092
1-800-426-9000

Most States do not survey all of their waterbodies during the 2-year reporting cycle required under CWA Section 305(b). Thus, the surveyed waters reported in Figure 1 are a subset of the Nation's total waters. In addition, the summary information based on surveyed waters may not represent general conditions in the Nation's total waters because States, Tribes, and other jurisdictions often focus on surveying major perennial rivers, estuaries, and public lakes with suspected pollution problems in order to direct scarce resources to areas that could pose the greatest risk. Many States, Tribes, and other jurisdictions lack the resources to collect use support information for nonperennial streams, small tributaries, and private ponds. This report does not predict the health of these unassessed waters, which include an unknown ratio of pristine waters to polluted waters.

Pollutants and Processes That Degrade Water Quality

Where possible, States, Tribes, and other jurisdictions identify the pollutants or processes that degrade water quality and indicators that document impacts of water quality degradation. The most widespread pollutants and processes identified in rivers, lakes, and estuaries are presented in Table 2. Pollutants include sediment, nutrients, and chemical contaminants (such as dioxins and metals). Processes that degrade waters include habitat modification (such as destruction of streamside vegetation) and hydrologic modification (such as flow reduction). Indicators of water quality degradation include physical, chemical, and biological parameters. Examples of biological parameters include species diversity and abundance. Examples of physical and chemical parameters include pH, turbidity, and temperature. Following are descriptions of the effects of the pollutants and processes most commonly identified in rivers, lakes, estuaries, coastal waters, wetlands, and ground water.

Low Dissolved Oxygen

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.

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.

Table 2. Five Leading Causes of Water Quality Impairment

Rank	Rivers	Lakes	Estuaries
1	Bacteria	Nutrients	Nutrients
2	Siltation	Siltation	Bacteria
3	Nutrients	Oxygen-Depleting Substances	Oxygen-Depleting Substances
4	Oxygen-Depleting Substances	Metals	Habitat Alterations
5	Metals	Suspended Solids	Oil and Grease

Source: Based on 1994 Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

Fish Kills

Fish kill reporting is a voluntary process; States, Tribes, and other jurisdictions are not required to report on how many fish kills occur, or what might have caused them. In many cases it is the public–anglers, and hunters, recreational boaters, or hikers–who first notice fish kills and report them to game wardens or other State officials. Many fish kills go undetected or unreported, and others may be difficult to investigate, especially if they occur in remote areas. This is because dead fish may be carried quickly downstream or may be difficult to count because of turbid conditions. It is therefore likely that the statistics presented by the States, Tribes, and other jurisdictions underestimate the total number of fish kills that occurred nationwide between 1992 and 1994.

Despite these problems, fish kills are an important consideration in water quality assessments. In 1994, 32 States, Tribes, and other jurisdictions reported a total of 1,454 fish kill incidents. These States attributed 737 of the fish kills to pollution, 257 to unknown causes, 263 to natural conditions (such as low flow and high temperatures), and 229 kills to ambiguous causes. Pollutants most often cited as the cause of kills include oxygen-depleting substances, sewage, pesticides, manure and silage, oil and gas, chlorine, and ammonia. Leading sources of fish kills include agricultural activities, industrial discharges, municipal sewage treatment plant discharges, spills, runoff, and pesticide applications.

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 examples of oxygen-depleting 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 glut of food 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.

Toxic pollutants can indirectly lower oxygen concentrations 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

Chesapeake Bay Foundation, Richmond, VA

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 lead to oxygen depletion. Oxygen concentrations can fluctuate daily during algal 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.

Sediment 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.

Sediment and siltation can severely alter aquatic communities. Sediment 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. 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 stream banks also deposit silt and sediment in waterbodies. Removal of vegetation on shore can accelerate streambank erosion.

Chesapeake Bay Foundation, Richmond, VA

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, stormwater 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 polychlorinated biphenyls (PCBs), dioxins, and the pesticide 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.

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 include:

- Removal of streamside vegetation that stabilizes the shoreline and provides shade, which moderates instream temperatures
- Excavation of cobbles from a stream bed that provide nesting habitat for fish
- Stream burial
- Excessive suburban 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.

Other pollutants include salts and oil and grease. Fresh waters may become unfit for aquatic life and some human uses when they become contaminated by salts. Sources of salinity include irrigation runoff, brine used in oil extraction, road deicing operations, and the intrusion of sea water into ground and surface waters in coastal areas. Crude oil and processed petroleum products may be spilled during extraction, processing, or transport or leaked from underground storage tanks.

Table 3. 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 Sewers	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, lawns, and other paved areas.
Agricultural	Crop production, pastures, rangeland, feedlots, other animal holding areas
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, streambank modification

Sources of Water Pollution

Sources of impairment generate the pollutants that violate use support criteria (Table 3). Point sources discharge pollutants directly into surface waters from a conveyance. Point sources include industrial facilities, municipal sewage treatment plants, and combined sewer overflows. Nonpoint sources deliver pollutants to surface waters from diffuse origins. Nonpoint sources include urban runoff, agricultural runoff, and atmospheric deposition of contaminants in air pollution. Habitat alterations, such as hydromodification, dredging, and streambank destabilization, can also degrade water quality.

Throughout this document, EPA rates the significance of causes and sources of pollution by the percentage of impaired waters impacted by each individual cause or source (obtained from the Section 305(b) reports submitted by the States, Tribes, and other jurisdictions). Note that the cause and source rankings do not describe the condition of all waters in the United States because the States identify the causes and sources degrading some of their impaired waters, which are a small subset of surveyed waters, which are a subset of the Nation's total waters. For example, the States identified sources degrading some of the 224,236 impaired river miles, which represent 36% of the surveyed river miles and only 6% of the Nation's total stream miles.

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

Clean Water Act, Section 502(14)

Table 4 lists the leading sources of impairment related to human activities as reported by States, Tribes, and other jurisdictions for their rivers, lakes, and estuaries. Other sources cited include removal of riparian vegetation, forestry activities, land disposal, petroleum extraction and processing activities, and construction. In addition to human activities, the States, Tribes, and other jurisdictions also reported impairments from natural sources. Natural sources refer to an assortment of water quality problems:

- Natural deposits of salts, gypsum, nutrients, and metals in soils that leach into surface and ground waters
- Warm weather and dry conditions that raise water temperatures, depress dissolved oxygen concentrations, and dry up shallow waterbodies
- Low-flow conditions and tannic acids from decaying leaves that lower pH and dissolved oxygen concentrations in swamps draining into streams.

With so many potential sources of pollution, it is difficult and expensive for States, Tribes, and other jurisdictions to identify specific sources responsible for water quality impairments. Many States and other jurisdictions lack funding for monitoring to identify all but the most apparent sources degrading waterbodies. Local management priorities may focus monitoring budgets on other water quality issues, such as identification of contaminated fish populations that pose a human health risk. Management priorities may also direct monitoring efforts to larger waterbodies and overlook sources impairing smaller waterbodies. As a result, the States, Tribes, and other jurisdictions do not associate every impacted waterbody with a source of impairment in their 305(b) reports, and the summary cause and source information presented in this report applies exclusively to a subset of the Nation's impaired waters.

Table 4. Five Leading Sources of Water Quality Impairment Related to Human Activities

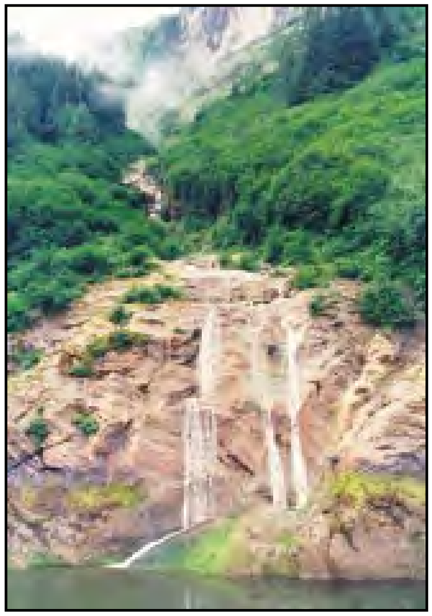
Rank	Rivers	Lakes	Estuaries
1	Agriculture	Agriculture	Urban Runoff/ Storm Sewers
2	Municipal Sewage Treatment Plants	Municipal Sewage Treatment Plants	Municipal Sewage Treatment Plants
3	Hydrologic/Habitat Modification	Urban Runoff/ Storm Sewers	Agriculture
4	Urban Runoff/ Storm Sewers	Unspecified Nonpoint Sources	Industrial Point Sources
5	Resource Extraction	Hydrologic/Habitat Modification	Petroleum Activities

Source: Based on 1994 Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

Rivers and Streams

Rivers and streams are characterized by flow. **Perennial** rivers and streams flow continuously, all year round. **Nonperennial** rivers and streams stop flowing for some 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 showers. Nonperennial streams provide critical habitats for nonfish species, such as amphibians and dragonflies, as well as safe havens for juvenile fish to escape from predation by larger fish.

The health of rivers and streams is directly linked to habitat integrity on shore and in adjacent wetlands. Stream quality will deteriorate if activities damage shoreline (i.e., riparian) vegetation and wetlands, which filter pollutants from runoff and bind soils. Removal of vegetation also eliminates shade that moderates stream temperature as well as the land temperature that can warm runoff entering surface waters. Stream temperature, in turn, affects the availability of dissolved oxygen in the water column for fish and other aquatic organisms.



Barry Burgan, U.S. EPA

Overall Water Quality

For the 1994 Report, 58 States, Territories, Tribes, Commissions, and the District of Columbia surveyed 615,806 miles (17%) of the Nation's total 3.5 million miles of rivers and streams (Figure 2). The surveyed rivers and streams represent 48% of the 1.3 million miles of perennial rivers and streams that flow year round in the lower 48 States.

Altogether, the States and Tribes surveyed 27,075 fewer river miles in 1994 than in 1992. Individually, most States reported that they surveyed more river miles in 1994, but their increases were offset by a decline of 85,000 surveyed river miles reported by Montana, Mississippi, and Maryland. For 1994, these States reported use support status for only those river miles that they surveyed in direct monitoring programs or evaluations rather than using inferences for unsurveyed waters.

The following discussion applies exclusively to surveyed waters and cannot be extrapolated to describe conditions in the Nation's rivers as a whole because the States, Tribes, and other jurisdictions do not consistently use statistical or probabilistic survey methods to characterize all their waters at this time. EPA is working with the States, Tribes, and other jurisdictions to expand survey coverage of the Nation's waters and expects future survey information to cover a greater portion of the Nation's rivers and streams.

Figure 2. River Miles Surveyed

Total rivers = 3.5 million miles
Total surveyed = 615,806 miles

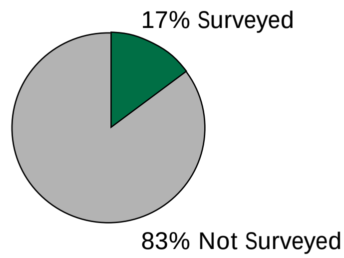
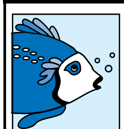
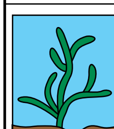


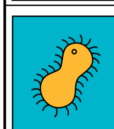
Figure 3. Levels of Overall Use Support – Rivers



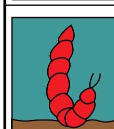
Good
(Fully Supporting)
57%



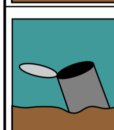
Good
(Threatened)
7%



Fair
(Partially Supporting)
22%



Poor
(Not Supporting)
14%



Poor
(Not Attainable)
<1%

Source: Based on 1994 State Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

Of the Nation's 615,806 surveyed river miles, the States, Tribes, and other jurisdictions found that 64% have good water quality. Of these waters, 57% fully support their designated uses, and an additional 7% support uses but are threatened and may become impaired if pollution control actions are not taken (Figure 3).

Some form of pollution or habitat degradation prevents the remaining 36% (224,236 miles) of the surveyed river miles from fully supporting a healthy aquatic community or human activities all year round. Twenty-two percent of the surveyed river miles have fair water quality that partially supports designated uses. Most of the time, these waters provide adequate habitat for aquatic organisms and support human activities, but periodic pollution interferes with these activities and/or stresses aquatic life. Fourteen percent of the surveyed river miles have poor water quality that consistently stresses aquatic life and/or prevents people from using the river for activities such as swimming and fishing.

What Is Polluting Our Rivers and Streams?

The States and Tribes report that bacteria pollute 76,397 river miles (which equals 34% of the impaired river miles) (Figure 4). Bacteria provide evidence of possible fecal contamination that may cause illness if the public ingests the water.

Siltation, composed of tiny soil particles, remains one of the most widespread pollutants impacting rivers and streams. The States and Tribes reported that siltation impairs 75,792 river miles (which equals 34% of the impaired river miles).

Bacteria and siltation are the most widespread pollutants in rivers and streams, affecting 34% of the impaired river miles.

Siltation alters aquatic habitat and suffocates fish eggs and bottom-dwelling organisms. Excessive siltation can also interfere with drinking water treatment processes and recreational use of a river.

In addition to siltation and bacteria, the States and Tribes also reported that nutrients, oxygen-depleting substances, metals, and habitat alterations impact more miles of rivers and streams than other pollutants and processes. Often, several pollutants and processes impact a single river segment. For example, a process, such as removal of shoreline vegetation, may accelerate erosion of sediment and nutrients into a stream.

Where Does This Pollution Come From?

The States and Tribes reported that agriculture is the most widespread source of pollution in the Nation's surveyed rivers (Figure 4). Agriculture generates pollutants that degrade aquatic life or interfere with public use of 134,557 river miles (which equals 60% of the impaired river miles) in 49 States and Tribes.

Twenty-one States reported the size of rivers 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.
- Rangeland – land grazed by animals that is seldom enhanced by the application of fertilizers or pesticides, although managers sometimes modify plant species to a limited extent.
- Pastureland – 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.
- Feedlots – facilities where animals are fattened and confined at high densities.
- Animal Holding Areas – facilities where animals are confined briefly before slaughter.

The States reported that nonirrigated crop production impaired the most river miles, followed by irrigated crop production, rangeland, feedlots, pastureland, and animal holding areas.

Many States reported declines in pollution from sewage treatment

Agriculture is the leading source of impairment in the Nation's rivers, affecting 60% of the impaired river miles.

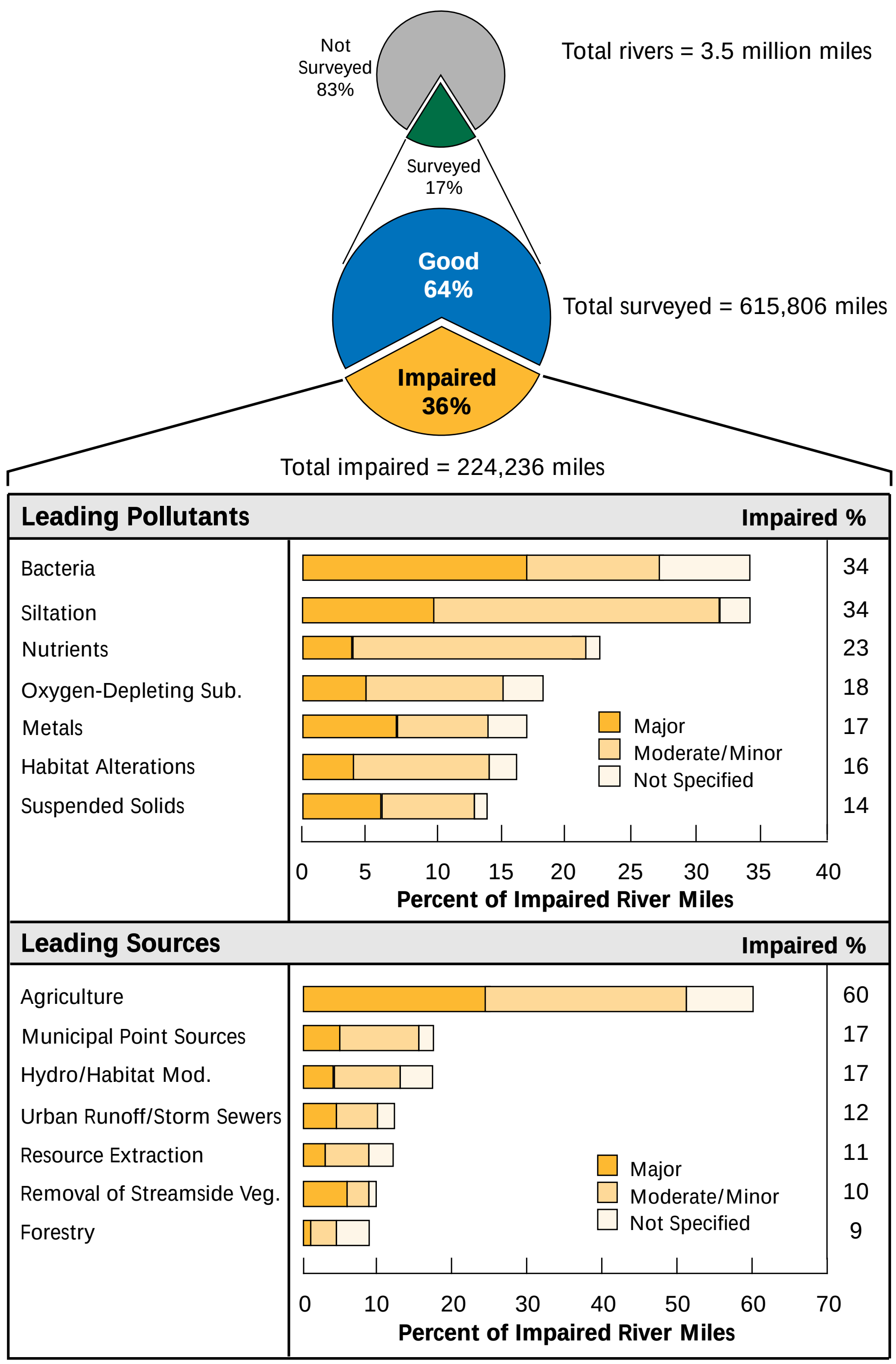
plants and industrial discharges as a result of sewage treatment plant construction and upgrades and permit controls on industrial discharges. Despite the improvements, municipal sewage treatment plants remain the second most common source of pollution in rivers (impairing 37,443 miles) because population growth increases the burden on our municipal facilities.

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 will be more subtle and require innovative management strategies that go beyond point source controls.

The States, Tribes, and other jurisdictions also reported that urban runoff and storm sewers impair 26,862 river miles (12% of the impaired rivers), resource extraction impairs 24,059 river miles (11% of the impaired rivers), and removal of streamside vegetation impairs 21,706 river miles (10% of the impaired rivers).

The States, Tribes, and other jurisdictions also report that "natural" sources impair significant stretches of rivers and streams. "Natural" sources, such as low flow and soils with arsenic deposits, can prevent waters from supporting uses in the absence of human activities.

Figure 4. Impaired River Miles: Pollutants and Sources



Source: Based on 1994 Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

Lakes, Ponds, and Reservoirs

Lakes are sensitive to pollution inputs because lakes flush out their contents relatively slowly. Even under natural conditions, lakes undergo eutrophication, an aging process that slowly fills in the lake with sediment and organic matter (see sidebar). The eutrophication process alters basic lake characteristics such as depth, biological productivity, oxygen levels, and water clarity. The eutrophication process is commonly defined by a series of trophic states as described in the sidebar.

Overall Water Quality

Forty-eight States, Tribes, and other jurisdictions surveyed overall use support in more than 17.1 million lake acres representing 42% of the approximately 40.8 million total acres of lakes, ponds, and reservoirs in the Nation (Figure 5). For 1994, the States surveyed about 1 million fewer lake acres than in 1992.

The number of surveyed lake acres declined because several States separated fish tissue data from their survey of overall use support. Some of these States, such as Minnesota, have established massive databases of fish tissue contamination information (which is used to establish fish consumption advisories), but lack other types of water quality data for many of their lakes. In 1994, these States chose not to assess overall use support entirely with fish tissue data alone, which is a very narrow indicator of water quality.

The States and Tribes reported that 63% of their surveyed 17.1 million lake acres have good water quality. Waters with good quality include 50% of the surveyed lake acres fully supporting uses and 13% of the surveyed lake acres that are threatened and might deteriorate if we fail to manage potential sources of pollution (Figure 6).

Some form of pollution or habitat degradation impairs the remaining 37% of the surveyed lake acres. Twenty-eight percent of the surveyed lake acres have fair water quality that partially supports designated uses. Most of the time, these waters provide adequate habitat for aquatic organisms and support human activities, but periodic pollution interferes with these activities and/or stresses aquatic life. Nine percent of the surveyed lake acres suffer from poor water quality that consistently stresses aquatic life and/or prevents people from using the lake for activities such as swimming and fishing.

John Theilgard, Bynum, NC

Figure 5. Lake Acres Surveyed

Total lakes = 40.8 million acres
Total surveyed = 17.1 million acres

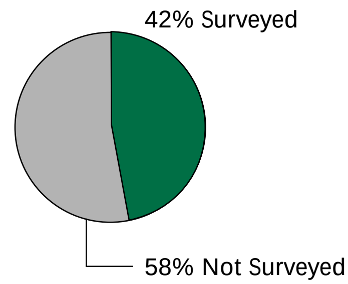
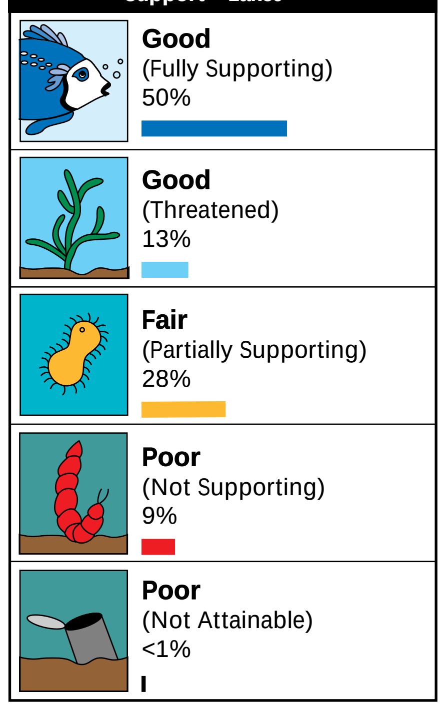


Figure 6. Levels of Overall Use Support – Lakes



Source: Based on 1994 State Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

What Is Polluting Our Lakes, Ponds, and Reservoirs?

Forty-one States, the District of Columbia, and Puerto Rico reported the number of lake acres impacted by individual pollutants and processes.

Thirty-seven States and Puerto Rico identified more lake acres polluted by nutrients than any other pollutant or process (Figure 7). The States and Puerto Rico reported that extra nutrients pollute 2.8 million lake acres (which equals 43% of the impaired lake acres). Healthy lake ecosystems contain nutrients in small quantities, but extra inputs of nutrients from human activities unbalance lake ecosystems.

In addition to nutrients, the States, Puerto Rico, and the District of Columbia report that siltation pollutes 1.8 million lake acres (which equals 28% of the impaired lake acres), enrichment by organic wastes that deplete oxygen impacts 1.6 million lake acres (which equals 24% of the impaired lake acres), and metals pollute 1.4 million acres (which equals 21% of the impaired lake acres).

Metals declined from the most widespread pollutant impairing lakes in the 1992 305(b) reporting

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.)

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.

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. Twenty-eight States reported the results of lake acidification assessments. These States assessed pH (a measure of acidity) at more than 5,933 lakes and detected acidic conditions in 526 lakes and a threat of acidic conditions in 423 lakes. Most of the States that assessed acidic conditions are located in the Northeast, upper Midwest, and the South.

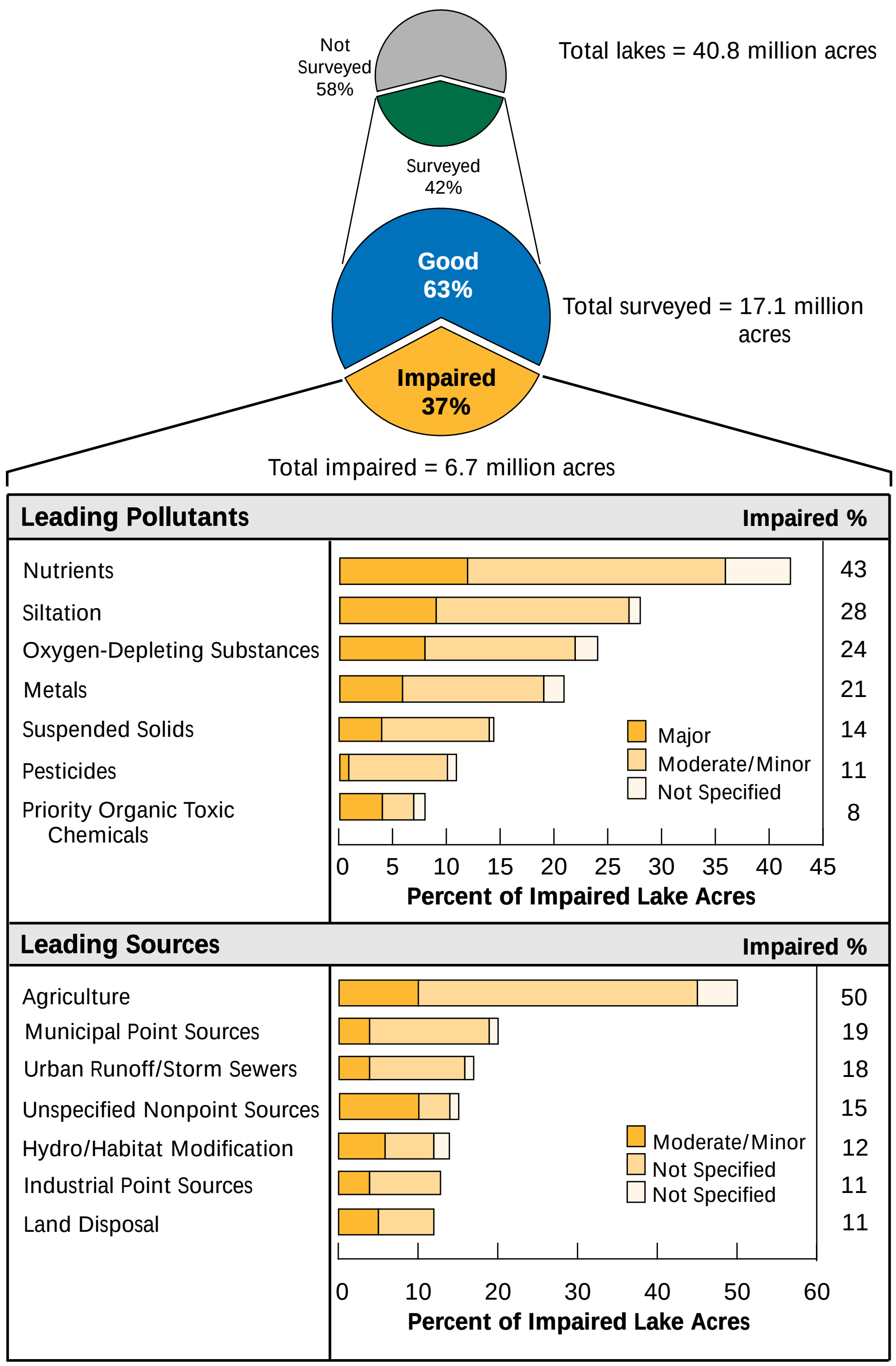
Only 11 States identified sources of acidic conditions. Maine and New Hampshire attributed most of their acid lake conditions to acid deposition from acidic rain, fog, or dry deposition in conjunction with natural conditions that limit a lake's capacity to neutralize acids. Alabama, Kansas, Maryland, Montana, Oklahoma, and Tennessee reported that acid mine drainage resulted in acidic lake conditions or threatened lakes with the potential to generate acidic conditions.

cycle to the fourth leading pollutant impairing lakes in 1994. The decline is due to changes in State reporting and assessment methods rather than a measured decrease in metals contamination. In 1994, several States chose to no longer assess overall use support with fish contamination data alone. Much of that data consisted of measurements of metals in fish tissue. As a result of excluding these fish tissue data, the national estimate of lake acres impaired by metals fell by over 2 million acres in 1994.

More States reported impairments due to nutrients than any other single pollutant.

Forty-one States also surveyed trophic status, which is associated with nutrient enrichment, in 9,735 of their lakes. Nutrient enrichment tends to increase the proportion of lakes in the eutrophic and hypereutrophic categories. These States reported that 18% of the lakes they surveyed for trophic status were oligotrophic, 32% were mesotrophic, 36% were eutrophic, 6% were hypereutrophic, and 3% were dystrophic. This information may not be representative of national lake conditions because States often assess lakes in response to a problem or public complaint or because of their easy accessibility. It is likely that more remote lakes—which are probably less impaired—are underrepresented in these assessments.

Figure 7. Impaired Lake Acres: Pollutants and Sources



Source: Based on 1994 Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

Where Does This Pollution Come From?

Forty-two States and Puerto Rico reported sources of pollution in some of their impacted lakes, ponds, and reservoirs. These States and Puerto Rico reported that agriculture is the most widespread source of pollution in the Nation's surveyed lakes (Figure 7). Agriculture generates pollutants that degrade aquatic life or interfere with public use of 3.3 million lake acres (which equals 50% of the impaired lake acres).

Agriculture is the leading source of impairment in lakes, affecting 50% of impaired lake acres.

Chesapeake Bay Foundation, Richmond, VA

The States and Puerto Rico also reported that municipal sewage treatment plants pollute 1.3 million lake acres (19% of the impaired lake acres), urban runoff and storm sewers pollute 1.2 million lake acres (18% of the surveyed lake acres), unspecified nonpoint sources impair 989,000 lake acres (15% of the impaired lake acres), hydrologic modifications and habitat alterations degrade 832,000 lake acres (12% of the impaired lake acres), and industrial point sources pollute 759,000 lake acres (11% of the impaired lake acres). Many States prohibit new point source discharges into lakes, but existing municipal sewage treatment plants remain a leading source of pollution entering lakes.

The States and Puerto Rico listed numerous sources that impact several hundred thousand lake acres, including land disposal of wastes, construction, flow regulation, highway maintenance and runoff, contaminated sediments, atmospheric deposition of pollutants, and onsite wastewater systems (including septic tanks).

The Great Lakes

The Great Lakes contain one-fifth of the world's fresh surface water and are stressed by a wide range of pollution sources, including air pollution. Many of the pollutants that reach the Great Lakes remain in the system indefinitely because the Great Lakes are a relatively closed water system with few natural outlets. Despite dramatic declines in the occurrence of algal blooms, fish kills, and localized "dead" zones depleted of oxygen, less visible problems continue to degrade the Great Lakes.

Overall Water Quality

The States surveyed 94% of the Great Lakes shoreline miles for 1994 and reported that fish consumption advisories and aquatic life concerns are the dominant water quality problems, overall, in the Great Lakes (Figure 8). The States reported that most of the Great Lakes nearshore waters are safe for swimming and other recreational activities and can be used as a source of drinking water with normal treatment. However, only 2% of the surveyed nearshore waters fully support designated uses, overall, and 1% support uses but are threatened (Figure 9). About 97% of the surveyed waters do not fully support designated uses, overall, because fish consumption advisories are posted throughout the nearshore waters of the Great Lakes and water quality conditions are unfavorable for supporting aquatic life in many cases. Aquatic life impacts result from persistent toxic pollutant burdens in birds, habitat degradation and destruction, and

Paul Goetz, Cary, NC

Figure 8. Great Lakes Shore Miles Surveyed

Total Great Lakes = 5,559 miles
Total surveyed = 5,224 miles

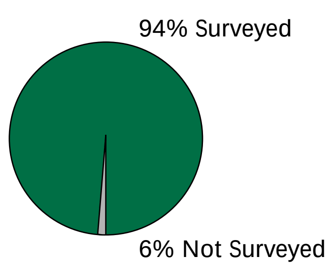
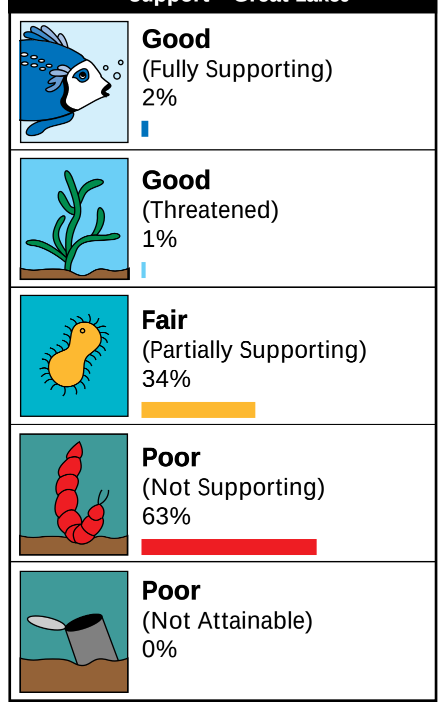


Figure 9. Levels of Overall Use Support – Great Lakes



Source: Based on 1994 State Section 305(b) reports.

competition and predation by nonnative species such as the zebra mussel and the sea lamprey.

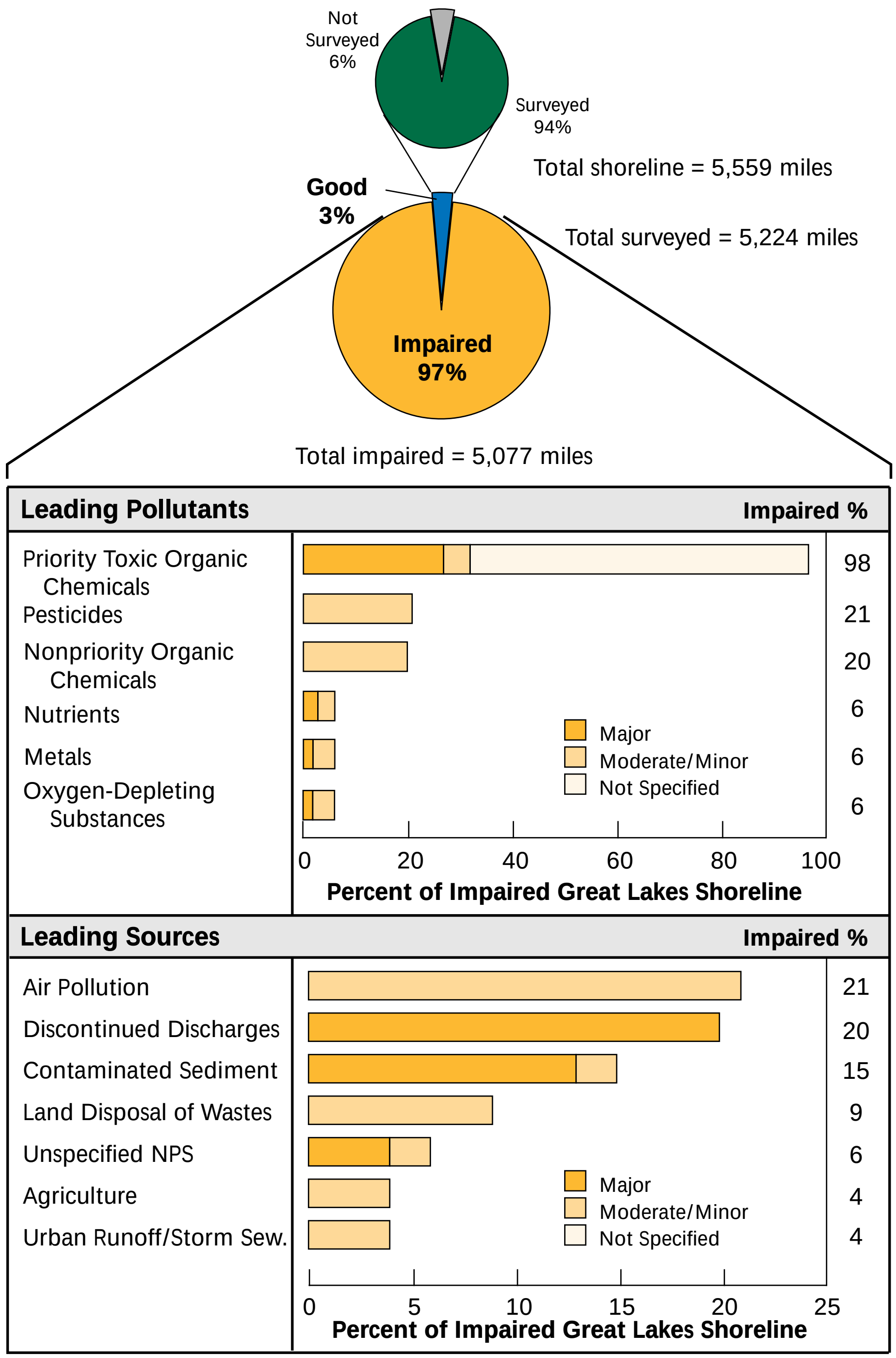
Considerable progress has been made in controlling conventional pollutants, but the Great Lakes are still subject to the effects of toxic pollutants.

These figures do not address water quality conditions in the deeper, cleaner, central waters of the Lakes.

What Is Polluting the Great Lakes?

The States reported that most of the Great Lakes shoreline is polluted by toxic organic chemicals–primarily PCBs–that are often found in fish tissue samples. The Great Lakes States reported that toxic organic chemicals impact 98% of the impaired Great Lakes shoreline miles. Other leading causes of impairment include pesticides, affecting 21%; nonpriority organic chemicals, affecting 20%; nutrients, affecting 6%; and metals, affecting 6% (Figure 10).

Figure 10. Impaired Great Lakes Shoreline: Pollutants and Sources



Source: Based on 1994 Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

Where Does This Pollution Come From?

Only four of the eight Great Lakes States measured the size of their Great Lakes shoreline polluted by specific sources. These States have jurisdiction over one-third of the Great Lakes shoreline, so their findings do not necessarily reflect conditions throughout the Great Lakes Basin.

- Wisconsin identifies air pollution and discontinued discharges as a source of pollutants contaminating all 1,017 of their surveyed shoreline miles. Wisconsin also identified smaller areas impacted by contaminated sediments, nonpoint sources, industrial and municipal discharges, agriculture, urban runoff and storm sewers, combined sewer overflows, and land disposal of waste.

- Indiana attributes all of the pollution along its entire 43-mile shoreline to air pollution, urban runoff and storm sewers, industrial and municipal discharges, and agriculture.

- Ohio reports that nonpoint sources pollute 86 miles of its 236 miles of shoreline, in-place contaminants impact 33 miles, and land disposal of waste impacts 24 miles of shoreline.

- New York identifies many sources of pollutants in their Great Lakes waters, but the State attributes the most miles of degradation to contaminated sediments (439 miles) and land disposal of waste (374 miles).

Phil Johnson, U.S. EPA, Region 8

Estuaries

Estuaries are areas partially surrounded by land where rivers meet the sea. They are characterized by varying degrees of salinity, complex water movements affected by ocean tides and river currents, and high turbidity levels. They are also highly productive ecosystems with a range of habitats for many different species of plants, shellfish, fish, and animals.

Many species permanently inhabit the estuarine ecosystem; others, such as shrimp, use the nutrient-rich estuarine waters as nurseries before traveling to the sea.

Estuaries are stressed by the particularly wide range of activities located within their watersheds. They receive pollutants carried by rivers from agricultural lands and cities; they often support marinas, harbors, and commercial fishing fleets; and their surrounding lands are highly prized for development. These stresses pose a continuing threat to the survival of these bountiful waters.


Brian Murphy, Walnut Creek, CA

Overall Water Quality

Twenty-five coastal States and jurisdictions surveyed 78% of the Nation's total estuarine waters in 1994 (Figure 11). The States and other jurisdictions reported that 63% of the surveyed estuarine waters have good water quality that fully supports designated uses (Figure 12). Of these waters, 6% are threatened and might deteriorate if we fail to manage potential sources of pollution.

Some form of pollution or habitat degradation impairs the remaining 37% of the surveyed estuarine waters. Twenty-seven percent of the surveyed estuarine waters have fair water quality that partially supports designated uses. Most of the time these waters provide adequate habitat for aquatic organisms and support human activities, but periodic pollution interferes with these activities and/or stresses aquatic life. Nine percent of the surveyed estuarine waters suffer from poor water quality that consistently stresses aquatic life and/or prevents people from using the estuarine waters for activities such as swimming and shellfishing.

Figure 11. Estuary Square Miles Surveyed

Total estuaries = 34,388 square miles
Total surveyed = 26,847 square miles

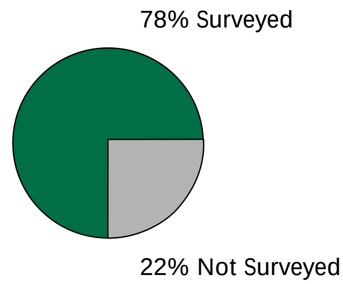
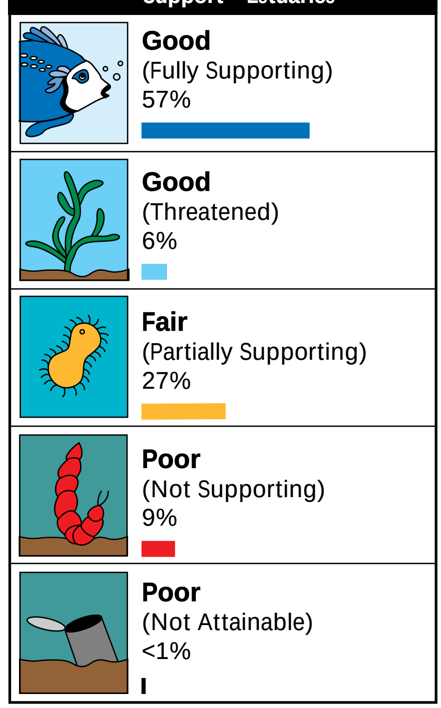


Figure 12. Levels of Overall Use Support – Estuaries



Source: Based on 1994 State Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

What Is Polluting Our Estuaries?

The States identified more square miles of estuarine waters polluted by nutrients and bacteria than any other pollutant or process (Figure 13). Fifteen States reported that extra nutrients pollute 4,548 square miles of estuarine waters (which equals 47% of the impaired estuarine waters). As in lakes, extra inputs of nutrients from human activities destabilize estuarine ecosystems.

Twenty-five States reported that bacteria pollute 4,479 square miles of estuarine waters (which equals 46% of the impaired estuarine waters). Bacteria provide evidence that an estuary is contaminated with sewage that may contain numerous viruses and bacteria that cause illness in people.

The States also report that oxygen depletion from organic wastes impacts 3,127 square miles (which equals 32% of the impaired estuarine waters), habitat alterations impact 1,564 square miles (which equals 16% of the impaired estuarine waters), and oil and grease pollute 1,344 square miles (which equals 14% of the impaired estuarine waters).

Chris Inghram, age 8, Bruner Elementary, North Las Vegas, NV

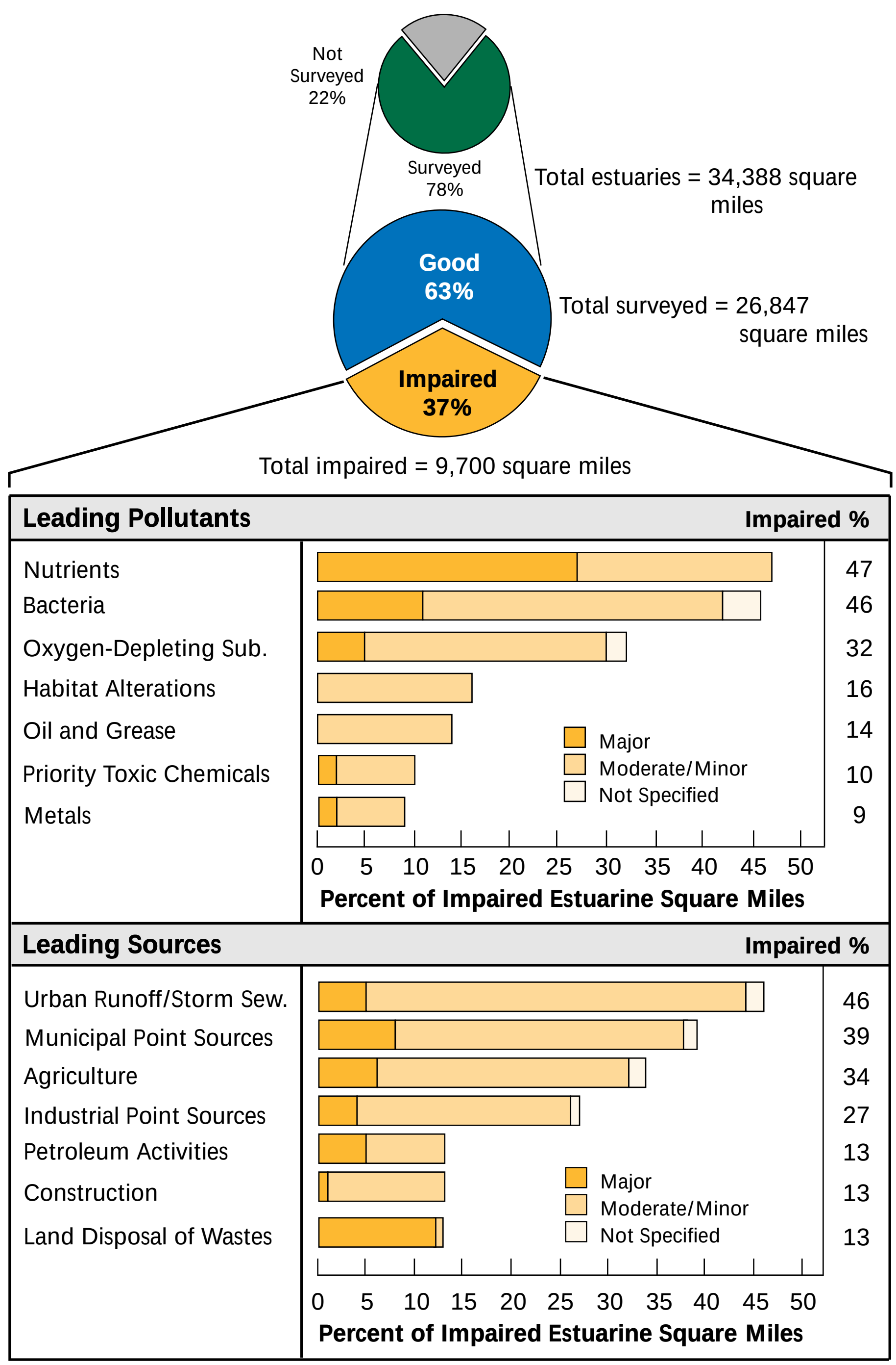
Where Does This Pollution Come From?

Twenty-three States reported that urban runoff and storm sewers are the most widespread source of pollution in the Nation's surveyed estuarine waters. Pollutants in urban runoff and storm sewer effluent degrade aquatic life or interfere with public use of 4,508 square miles of estuarine waters (which equals 46% of the impaired estuarine waters) (Figure 13).

The States also reported that municipal sewage treatment plants pollute 3,827 square miles of estuarine waters (39% of the impaired estuarine waters), agriculture pollutes 3,321 square miles of estuarine waters (34% of the impaired estuarine waters), and industrial discharges pollute 2,609 square miles (27% of the impaired estuarine waters). Urban sources contribute more to the degradation of estuarine waters than agriculture because urban centers are located adjacent to most major estuaries.

Krista Rose, age 8, Bruner Elementary, North Las Vegas, NV

Figure 13. Impaired Estuaries: Pollutants and Sources



Source: Based on 1994 Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

Ocean Shoreline Waters

Although the oceans are expansive, they are vulnerable to pollution from numerous sources, including city storm sewers, ocean outfalls from sewage treatment plants, overboard disposal of debris and sewage, oil spills, and bilge discharges that contain oil and grease. Nearshore ocean waters, in particular, suffer from the same pollution problems that degrade our inland waters.

Overall Water Quality

Thirteen of the 27 coastal States and Territories surveyed only 9% of the Nation's estimated 58,421 miles of ocean coastline (Figure 14). Most of the surveyed waters (4,834 miles, or 93%) have good quality that supports a healthy aquatic community and public activities (Figure 15). Of these waters, 225 miles (4% of the surveyed shoreline) are threatened and may deteriorate in the future.

Some form of pollution or habitat degradation impairs the remaining 7% of the surveyed shoreline (374 miles). Five percent of the surveyed estuarine waters have fair water quality that partially supports designated uses. Most of the time, these waters provide adequate habitat for aquatic organisms and support human activities, but periodic pollution interferes with these activities and/or stresses aquatic life. Only 2% of the surveyed shoreline suffers from poor water quality that consistently stresses aquatic life and/or prevents people from using the shoreline for activities such as swimming and shellfishing.

Paul Goetz, Cary, NC

Only six of the 27 coastal States identified pollutants and sources of pollutants degrading ocean shoreline waters. General conclusions cannot be drawn from the information supplied by these States because these States border less than 1% of the shoreline along the contiguous States. The six States identified impacts in their ocean shoreline waters from bacteria, metals, nutrients, turbidity, siltation, and pesticides. The six States reported that urban runoff and storm sewers, industrial discharges, land disposal of wastes, septic systems, agriculture, unspecified nonpoint sources, and combined sewer overflows (CSOs) pollute their coastal shoreline waters.

Figure 14. Ocean Shoreline Waters Surveyed

Total ocean shore = 58,421 miles
including Alaska's shoreline
Total surveyed = 5,208 miles

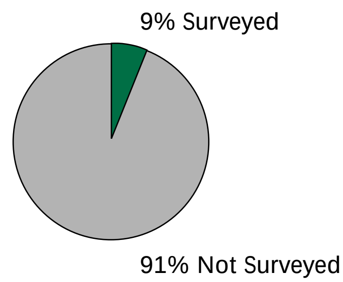
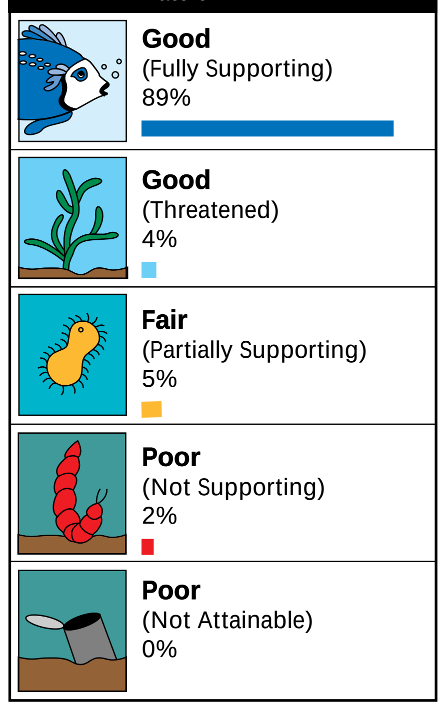


Figure 15. Levels of Overall Use Support – Ocean Shoreline Waters



Source: Based on 1994 State Section 305(b) reports submitted by States and Territories.

Wetlands

Wetlands are areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support (and that under normal circumstances does support) a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands, which are found throughout the United States, generally include swamps, marshes, bogs, and similar areas.

Wetlands are now recognized as some of the most unique and important natural areas on earth. They vary in type according to differences in local and regional hydrology, vegetation, water chemistry, soils, topography, and climate. Coastal wetlands include estuarine marshes; mangrove swamps found in Puerto Rico, Hawaii, Louisiana, and Florida; and Great Lakes coastal wetlands. Inland wetlands, which may be adjacent to a waterbody or isolated, include marshes and wet meadows, bottomland hardwood forests, Great Plains prairie potholes, cypress-gum swamps, and southwestern playa lakes.

In their natural condition, wetlands provide many benefits, including food and habitat for fish and wildlife, water quality improvement, flood protection, shoreline erosion control, ground water exchange, as well as natural products for human use and opportunities for recreation, education, and research.

Wetlands help maintain and improve water quality by intercepting surface water runoff before it reaches open water, removing or retaining nutrients, processing chemical and organic wastes, and

Audrey Moore, U.S. EPA, Region 2

reducing sediment loads to receiving waters. As water moves through a wetland, plants slow the water, allowing sediment and pollutants to settle out. Plant roots trap sediment and are then able to metabolize and detoxify pollutants and remove nutrients such as nitrogen and phosphorus.

Wetlands function like natural basins, storing either floodwater that overflows riverbanks or surface water that collects in isolated depressions. By doing so, wetlands help protect adjacent and downstream property from flood damage. Trees and other wetlands vegetation help slow the speed of flood waters. This action, combined with water storage, can lower flood heights and reduce the water's erosive potential. In agricultural areas, wetlands can help reduce the likelihood of flood damage to crops. Wetlands within and upstream of urban areas are especially valuable for flood protection because urban development increases the rate and volume of surface water runoff, thereby increasing the risk of flood damage.

Wetlands produce a wealth of natural products, including fish and shellfish, timber, wildlife, and wild rice. Much of the Nation's fishing and shellfishing industry harvests wetlands-dependent species. A national survey conducted by the Fish and Wildlife Service (FWS) in 1991 illustrates the economic value of some of the wetlands-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. It is estimated that 71% of commercially valuable fish and shellfish depend directly or indirectly on coastal wetlands.

Overall Water Quality

The States, Tribes, and other jurisdictions are making progress in developing specific designated uses and water quality standards for wetlands, but many States and Tribes still lack specific water quality criteria and monitoring programs for wetlands. Without criteria and monitoring data, most States and Tribes cannot evaluate use support. To date, only nine States and Tribes reported the designated use support status for some of their wetlands. Only one State used quantitative data as a basis for the use support decisions.

EPA cannot derive national conclusions about water quality conditions in all wetlands because the States used different methodologies to survey only 3% of the total wetlands in the Nation. Summarizing State wetlands data would also produce misleading results because two States (North Carolina and Louisiana) contain 91% of the surveyed wetlands acreage.

What Is Polluting Our Wetlands and Where Does This Pollution Come From?

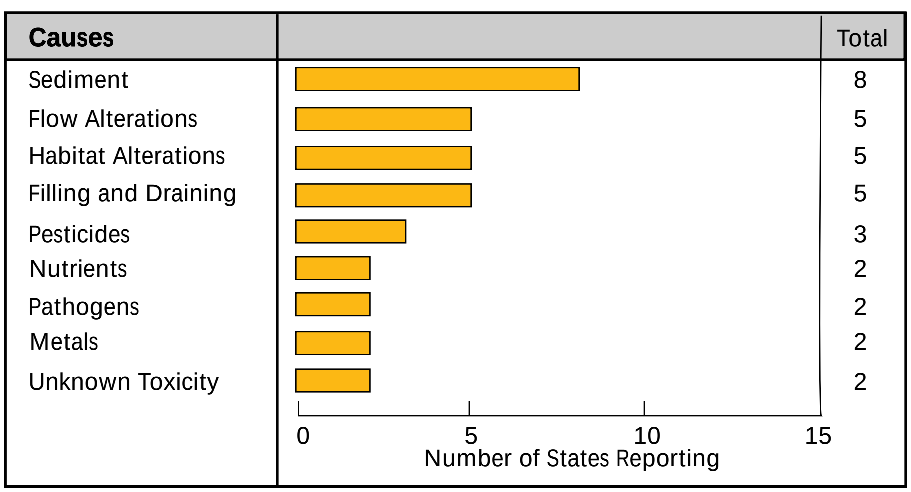
The States have even fewer data to quantify the extent of pollutants degrading wetlands and the sources of these pollutants. Although most States cannot quantify wetlands area impacted by individual causes and sources of degradation, 12 States identified causes and 13 States identified sources known to degrade wetlands integrity to some extent. These States listed sediment as the most widespread cause of degradation impacting wetlands, followed by flow alterations, habitat modifications, and draining (Figure 16). Agriculture topped the list of sources degrading wetlands, followed by urban runoff, hydrologic modification, and municipal point sources (Figure 17).

Wetlands Loss: A Continuing Problem

It is estimated that over 200 million acres of wetlands existed in the lower 48 States at the time of European settlement. Since then, extensive wetlands acreage has been lost, with many of the original wetlands drained and converted to farmland and urban development. Today, less than half of our original wetlands remain. The losses amount to an area equal to the size of California. According to the U.S. Fish and Wildlife Service's *Wetlands Losses in the United States 1780's to 1980's*, the three States that have sustained the greatest percentage of wetlands loss are California (91%), Ohio (90%), and Iowa (89%).

According to FWS status and trends reports, the average annual loss of wetlands has decreased over the past 40 years. The average annual loss from the mid-1950s to the mid-1970s was 458,000 acres, and from the mid-1970s to the mid-1980s it was 290,000 acres. Agriculture was responsible for 87% of the loss from the mid-1950s to the mid-1970s and 54% of the loss from the mid-1970s to the mid-1980s.

Figure 16. Causes Degrading Wetlands Integrity (12 States Reporting)



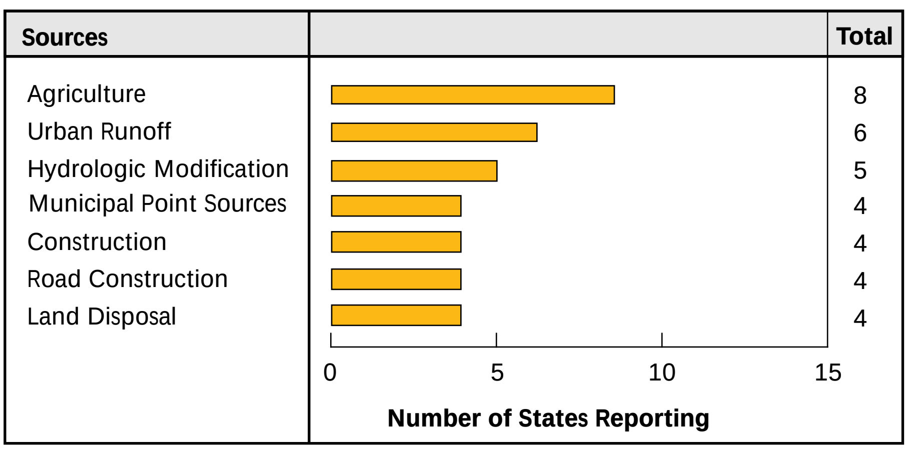
Source: Based on 1994 Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

A more recent estimate of wetlands losses from the National Resources Inventory (NRI), conducted by the Natural Resources Conservation Service (NRCS), indicates that 792,000 acres of wetlands were lost on non-Federal lands between 1982 and 1992 for a yearly loss estimate of 70,000 to 90,000 acres. This net loss is the result of gross losses of 1,561,300 acres of wetlands and gross gains of 768,700 acres of wetlands over the 10-year period. The NRI estimates are consistent with the trend of declining wetlands losses reported by FWS. Although losses have decreased, we still have to make progress toward our interim goal of no overall net loss of the Nation's remaining wetlands and the long-term goal of increasing the quantity and quality of the Nation's wetlands resource base.

The decline in wetlands losses is a result of the combined effect of several trends: (1) the decline in profitability in converting wetlands for agricultural production; (2) passage of Swampbuster provisions in the 1985 and 1990 Farm Bills that denied crop subsidy benefits to farm operators who converted wetlands to cropland after 1985; (3) presence of the CWA Section 404 permit programs as well as development of State management programs; (4) greater public interest and support for wetlands protection; and (5) implementation of wetlands restoration programs at the Federal, State, and local level.

Nineteen States listed sources of recent wetlands losses in their 1994 305(b) reports. Residential development and urban growth were cited as the leading sources of current losses. Other losses were due to commercial development; construction of roads, highways, and bridges; agriculture; and industrial development. In addition to human activities, a few States also reported that natural sources, such as rising lake levels, resulted in wetlands losses and degradation.

Figure 17. Sources Degrading Wetlands Integrity (12 States Reporting)



Source: Based on 1994 Section 305(b) reports submitted by States, Tribes, Territories, Commissions, and the District of Columbia.

Kings Park Elementary, 3rd Grade, Springfield, VA

More information on wetlands can be obtained from the EPA Wetlands Hotline at 1-800-832-7828.

Ground Water

Ninety-five percent of all fresh water available on earth (exclusive of icecaps) is ground water. Ground water–water found in natural underground rock formations called aquifers–is a vital natural resource with many uses. The extent of the Nation's ground water resources is enormous. At least 60% of the land area in the conterminous United States overlies aquifers that may be susceptible to contamination. Usable ground water exists in every State.

Aquifers can range in size from thin surficial formations that yield small quantities of ground water to large systems such as the High Plains aquifer that underlies eight western States and provides water to millions. Although the Nation's ground water is of good quality, it is recognized that ground water is more vulnerable to contamination than previously reported and that an increasing number of pollution events and contamination sources are threatening the integrity of the resource.

Ground Water Use

Nationally, 51% of the population relies to some extent on ground water as a source of drinking water. This percentage is even higher in rural areas where most residents rely on potable or treatable ground water as an economical source of drinking water. Eighty-one percent of community water systems are dependent on ground water. Seventy-four percent of community water systems are small ground water systems serving 3,300 people or less. Ninety-five percent of the approximately 200,000 noncommunity water systems (serving schools, parks, and other small facilities) are ground water systems.

Ground water provides drinking water for 51% of the population.

Jeff Reynolds, Raleigh, NC

Irrigation accounts for approximately 63% of national ground water withdrawals. Public drinking water supplies account for approximately 19% of the Nation's total ground water withdrawals. Domestic, commercial, livestock, industrial, mining, and thermoelectric withdrawals together account for approximately 18% of national ground water withdrawals.

Ground Water Quality

Although the 1994 Section 305(b) State Water Quality Reports indicate that, overall, the Nation's ground water is of good quality, many local areas have experienced significant ground water contamination. The sources and types of ground water contamination vary depending upon the region of the country. Those most frequently reported by States include:

- **Leaking underground storage tanks**. Approximately 1.2 million federally regulated underground storage tanks are buried at over 500,000 sites nationwide. An estimated 139,000 tanks have leaked and impacted ground water quality.

- **Agricultural activities**. Seventy-seven percent of the 1.1 billion pounds of pesticides produced annually in the United States is applied to land in agricultural production, which usually overlies aquifers.

- **Superfund sites**. More than 85% of all Superfund sites have some degree of ground water contamination. Most of these sites impact aquifers that are currently used, or potentially may be used, for drinking water purposes.

- **Septic tanks**. Approximately 23 million domestic septic tanks are in operation in the United States. These tanks impact ground water quality through the discharge of fluids into or above aquifers.

The most common contaminants associated with these sources include petroleum compounds, nitrates, metals, volatile organic compounds (VOCs), and pesticides.

States are reporting that ground water quality is most likely to be adversely affected by contamination in areas of high demand or stress. To combat these problems, States are developing programs designed to evaluate the overall quality and vulnerability of their ground water resources, to identify potential threats to ground water quality, and to identify methods to protect their ground water resources. Thirty-three States indicate that they have implemented statewide ground water monitoring programs.

Ground water monitoring programs vary widely among the States, depending upon the special needs of each of the States. For example, some States choose to monitor ground water quality in specific areas that are especially vulnerable to contamination, whereas other States may choose to monitor ground water quality on a statewide basis. When it comes to selecting chemicals to test for in the ground water, some States monitor for a large suite of chemicals, whereas other States limit monitoring to one or two specific chemicals that are a definite threat to ground water quality.

Ground water monitoring provides a great deal of information about the nature and quality of our Nation's ground water resources. Still, there is much we do not know about how human activities influence ground water quality. Our continued quest for information about the status of our ground water will help protect and preserve this vast and vulnerable resource. Through a greater understanding of how human activities influence ground water quality, we can better ensure the long-term availability of high-quality water for future generations.

Alisha Batten, age 8, Bruner Elementary, North Las Vegas, NV

Kings Park Elementary, 3rd Grade, Springfield, VA

Water Quality Protection Programs

Although significant strides have been made in reducing the impacts of discrete pollutant sources, our aquatic resources remain at risk from a combination of point sources and complex nonpoint sources, including air pollution. Since 1991, EPA has promoted the watershed protection approach as a holistic framework for addressing complex pollution problems.

The watershed protection approach is a place-based strategy that integrates water quality management activities within hydrologically defined drainage basins–watersheds–rather than areas defined by political boundaries. Thus, for a given watershed, the approach encompasses not only the water resource (such as a stream, lake, estuary, or ground water aquifer), but all the land from which water drains to the resource. To protect water resources, it is increasingly important to address the condition of land areas within the watershed because water carries the effects of human activities throughout the watershed as it drains off the land into surface waters or leaches into the ground water.

Under the Watershed Protection Approach (WPA), a "watershed" is a hydrogeologic area defined for addressing water quality problems. For example, a WPA watershed may be a river basin, a county-sized watershed, or a small drinking water supply watershed.

Mike Steuart, Minnesota Pollution Control Agency

EPA's Office of Water envisions the watershed protection approach as the primary mechanism for achieving clean water and healthy, sustainable ecosystems throughout the Nation. The watershed protection approach enables stakeholders to take a comprehensive look at ecosystem issues and tailor corrective actions to local concerns within the coordinated framework of a national water program. The emphasis on public participation also provides an opportunity to incorporate environmental justice issues into watershed restoration and protection solutions.

In May of 1994, the EPA Assistant Administrator for Water, Robert Perciasepe, created the Watershed Management Policy Committee to coordinate the EPA water program's support of the watershed protection approach. During 1995, EPA's water program managers, under the direction of the Watershed Management Policy Committee, evaluated their programs and identified additional activities needed to support the watershed protection approach in an action plan.

EPA's Office of Water will continue to promote and support the watershed protection approach at local, State, Tribal, Territorial, and Federal levels. The Office of Water recognizes that the watershed protection approach relies on active participation by local governments and citizens who have the most direct knowledge of local problems and opportunities in their watersheds. However, the Office of Water will look to the States, Tribes, and

Territories to create the framework for supporting local efforts because most EPA programs are implemented by the States, Tribes, and Territories.

The Clean Water Act

A number of laws provide the authority to develop and implement pollution control programs. The primary statute providing for water quality protection in the Nation's rivers, lakes, wetlands, estuaries, and coastal waters is the Federal Water Pollution Control Act of 1972, commonly known as the Clean Water Act.

The CWA and its amendments are the driving force behind many of the water quality improvements we have witnessed in recent years. Key provisions of the CWA provide the following pollution control programs.

Water quality standards and criteria – States, Tribes, and other jurisdictions adopt EPA-approved standards for their waters that define water quality goals for individual waterbodies. Standards consist of designated beneficial uses to be made of the water, criteria to protect those uses, and antidegradation provisions to protect existing water quality.

Effluent guidelines – The EPA develops nationally consistent guidelines limiting pollutants in discharges from industrial facilities and municipal sewage treatment plants. These guidelines are then used in permits issued to dischargers under the

The Watershed Protection Approach (WPA)

Several key principles guide the watershed protection approach:

- **Place-based focus** – Resource management activities are directed within specific geographical areas, usually defined by watershed boundaries, areas overlying or recharging ground water, or a combination of both.
- **Stakeholder involvement and partnerships** – Watershed initiatives involve the people most likely to be affected by management decisions in the decision making process. Stakeholder participation ensures that the objectives of the watershed initiative will include economic stability and that the people who depend on the water resources in the watershed will participate in planning and implementation activities. Watershed initiatives also establish partnerships between Federal, State, and local agencies and nongovernmental organizations with interests in the watershed.
- **Environmental objectives** – The stakeholders and partners identify environmental objectives (such as "populations of striped bass will stabilize or increase") rather than programmatic objectives (such as "the State will eliminate the backlog of discharge permit renewals") to measure the success of the watershed initiative. The environmental objectives are based on the condition of the ecological resource and the needs of people in the watershed.
- **Problem identification and prioritization** – The stakeholders and partners use sound scientific data and methods to identify and prioritize the primary threats to human and ecosystem health within the watershed. Consistent with the Agency's mission, EPA views ecosystems as the interactions of complex communities that include people; thus, healthy ecosystems provide for the health and welfare of humans as well as other living things.
- **Integrated actions** – The stakeholders and partners take corrective actions in a comprehensive and integrated manner, evaluate success, and refine actions if necessary. The watershed protection approach coordinates activities conducted by numerous government agencies and nongovernmental organizations to maximize efficient use of limited resources.

National Pollutant Discharge Elimination System (NPDES) program. Additional controls may be required if receiving waters are still affected by water quality problems after permit limits are met.

Total Maximum Daily Loads– The development of Total Maximum Daily Loads, or TMDLs, establishes the link between water quality standards and point/nonpoint source pollution control actions such as permits or Best Management Practices (BMPs). A TMDL calculates allowable loadings from the contributing point and nonpoint sources to a given waterbody and provides the quantitative basis for pollution reduction necessary to meet water quality standards. States, Tribes, and other jurisdictions develop and implement TMDLs for high-priority impaired or threatened waterbodies.

Permits and enforcement – All industrial and municipal facilities that discharge wastewater must have an NPDES permit and are responsible for monitoring and reporting levels of pollutants in their discharges. EPA issues these permits or can delegate that permitting authority to qualifying States or other jurisdictions. The States, other qualified jurisdictions, and EPA inspect facilities to determine if their discharges comply with permit limits. If dischargers are not in compliance, enforcement action is taken.

Grants – The EPA provides States with financial assistance to help support many of their pollution control programs. These programs include the State Revolving Fund program for construction and upgrading of municipal sewage treatment plants; water quality monitoring, permitting, and enforcement; and developing and implementing nonpoint source pollution controls, combined sewer and stormwater controls, ground water strategies, lake assessment, protection, and restoration activities, estuary and near coastal management programs, and wetlands protection activities.

Nonpoint source control – The EPA provides program guidance, technical support, and funding to help the States, Tribes, and other jurisdictions control nonpoint source pollution. The States, Tribes, and other jurisdictions are responsible for analyzing the extent and severity of their nonpoint source pollution problems and developing and implementing needed water quality management actions.

The CWA also established pollution control and prevention programs for specific waterbody categories, such as the Clean Lakes Program. Other statutes that also guide the development of water quality protection programs include:

- **The Safe Drinking Water Act**, under which States establish standards for drinking water quality, monitor wells and local water supply systems, implement drinking water protection programs, and implement Underground Injection Control (UIC) programs.

- **The Resource Conservation and Recovery Act**, which establishes State and EPA programs for ground water and surface water protection and cleanup and emphasizes prevention of releases through management standards in addition to other waste management activities.

- **The Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Program)**, which provides EPA with the authority to clean up contaminated waters during remediation at contaminated sites.

- **The Pollution Prevention Act of 1990**, which requires EPA to promote pollutant source reduction rather than focus on controlling pollutants after they enter the environment.

Protecting Lakes

Managing lake quality often requires a combination of in-lake restoration measures and pollution controls, including watershed management measures:

Restoration measures are implemented to reduce existing pollution problems. Examples of in-lake restoration measures include harvesting aquatic weeds, dredging sediment, and adding chemicals to precipitate nutrients out of the water column. Restoration measures focus on restoring uses of a lake and may not address the source of the pollution.

Pollution control measures deal with the sources of pollutants degrading lake water qual-34ity or threatening to impair lake water quality. Control measures include planning activities, regulatory actions, and implementation of BMPs to reduce nonpoint sources of pollutants.

During the 1980s, most States implemented chemical and mechanical in-lake restoration measures to control aquatic weeds and algae. In their 1994 Section 305(b) reports, the States and Tribes report a shift toward nonpoint source controls to reduce pollutant loads responsible for aquatic weed growth and algal blooms (Figure 18). Twenty-two States reported that they implemented best management practices to control nonpoint source pollution entering more than 171 lakes. The States reported that they implemented agricultural practices to control soil erosion, constructed retention and detention basins to control urban runoff, managed animal waste, revegetated shorelines, and constructed or restored wetlands to remove pollutants from runoff. Although the States reported that they still use in-lake treatments, the States recognize that source controls are needed in addition to in-lake treatments to restore lake water quality.

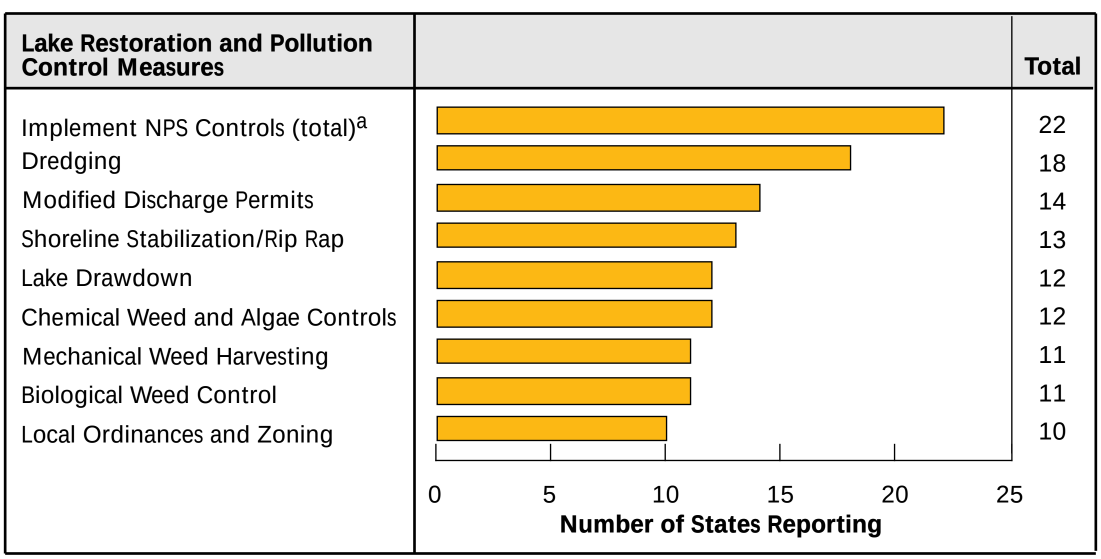
Successful lake programs require strong commitment from local citizens and cooperation from natural resource agencies at the local, State, and Federal levels.

The National Estuary Program

Section 320 of the Clean Water Act (as amended by the Water Quality Act of 1987) established the National Estuary Program (NEP) to protect and restore water quality and living resources in estuaries. The NEP adopts a geographic or watershed approach by planning and implementing pollution abatement activities for the estuary and its surrounding land area as a whole.

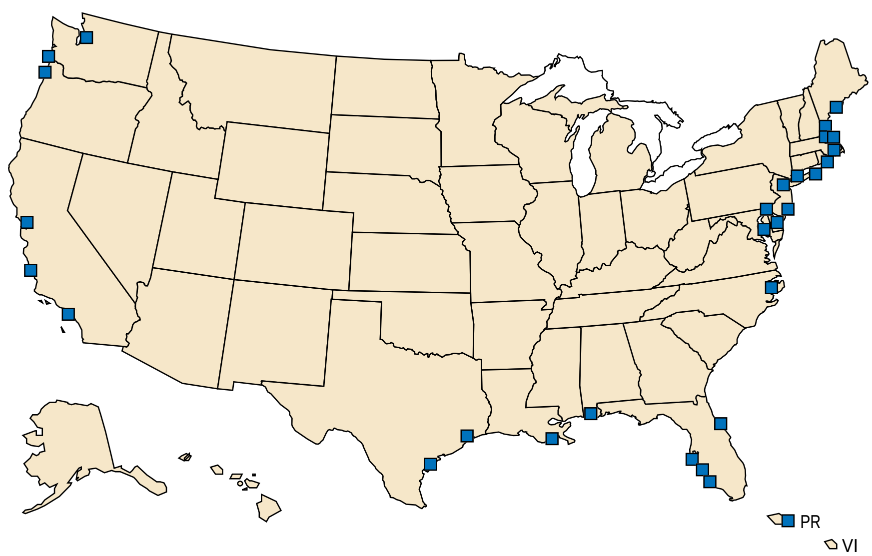
The NEP embodies the ecosystem approach by building coalitions, addressing multiple sources of contamination, pursuing habitat protection as a pollution control mechanism, and investigating cross-media transfer of pollutants from air and soil into specific estuarine waters. Under the NEP, a State governor nominates an estuary in his or her State for participation in the program. The State must demonstrate a likelihood of success in protecting candidate estuaries and provide evidence of institutional, financial, and political commitment to solving estuarine problems.

Figure 18



[a]Includes best management practices, such as conservation tillage, sediment detention basins, vegetated buffers, and animal waste management.

Figure 19. Locations of National Estuary Program Sites



If an estuary meets the NEP guidelines, the EPA Administrator convenes a management conference of representatives from interested Federal, Regional, State, and local governments; affected industries; scientific and academic institutions; and citizen organizations. The management conference defines program goals and objectives, identifies problems, and designs strategies to control pollution and manage natural resources in the estuarine basin. Each management conference develops and initiates implementation of a Comprehensive Conservation and Management Plan (CCMP) to restore and protect the estuary.

The NEP currently supports 28 estuary projects.

The NEP integrates science and policy by bringing water quality managers, elected officials, and stakeholders together with scientists from government agencies, academic institutions, and the private sector. Because the NEP is not a research program, it relies heavily on past and ongoing research of other agencies and institutions to support development of CCMPs.

With the addition of seven estuary sites in July of 1995, the NEP currently supports 28 estuary projects (see Figure 19). These 28 estuaries are nationally significant in their economic value as well as in their ability to support living resources. The project sites also represent a broad range of environmental conditions in estuaries throughout the United States and its Territories so that the lessons learned through the NEP can be applied to other estuaries.

Protecting Wetlands

A variety of public and private programs protect wetlands. Section 404 of the CWA continues to provide the primary Federal vehicle for regulating certain activities in wetlands. Section 404 establishes a permit program for discharges of dredged or fill material into waters of the United States, including wetlands.

The U.S. Army Corps of Engineers (COE) and EPA jointly implement the Section 404 program. The COE is responsible for reviewing permit applications and making permit decisions. EPA establishes the environmental criteria for making permit decisions and has the authority to review and veto Section 404 permits proposed for issuance by the COE. EPA is also responsible for determining geographic jurisdiction of the Section 404 permit program, interpreting statutory exemptions, and

Shortly after coming into office, the Clinton Administration convened an interagency working group to address concerns with Federal wetlands policy. After hearing from States, developers, farmers, environmental interests, members of Congress, and scientists, the working group developed a comprehensive 40-point plan for wetlands protection to make wetlands programs more fair, flexible, and effective. This plan was issued on August 24, 1993.

The Administration's Wetlands Plan emphasizes improving Federal wetlands policy by

- Streamlining wetlands permitting programs
- Increasing cooperation with private landowners to protect and restore wetlands
- Basing wetlands protection on good science and sound judgment
- Increasing participation by States, Tribes, local governments, and the public in wetlands protection.

overseeing Section 404 permit programs assumed by individual States. To date, only two States (Michigan and New Jersey) have assumed the Section 404 permit program from the COE. The COE and EPA share responsibility for enforcing Section 404 requirements.

The COE issues individual Section 404 permits for specific projects or general permits (Table 5). Applications for individual permits go through a review process that includes opportunities for EPA, other Federal agencies (such as the U.S. Fish and Wildlife Service and the National Marine Fisheries Service), State agencies, and the public to comment. However, the vast majority of activities proposed in wetlands are covered by Section 404 general permits. For example, in FY94, over 48,000 people applied to the COE for a Section 404 permit. Eighty-two percent of these applications were covered by general permits and were processed in an average of 16 days. It is estimated that another 50,000 activities are covered by general permits that do not require notification of the COE at all.

General permits allow the COE to permit certain activities without performing a separate individual permit review. Some general permits require notification of the COE before an activity begins. There are three types of general permits:

- Nationwide permits (NWPs) authorize specific activities across the entire Nation that the COE determines will have only minimal individual and cumulative impacts on the environment, including construction of minor road crossings and farm buildings, bank stabilization activities, and the filling of up to 10 acres of isolated or headwater wetlands.

- Regional permits authorize types of activities within a geographic area defined by a COE District Office.

- Programmatic general permits are issued to an entity that the COE determines may regulate activities within its jurisdictional wetlands.

Table 5. Federal Section 404 Permits

General Permits (streamlined permit review procedures)				Individual Permits
Nationwide Permits	**Regional Permits**	**Programmatic Permits**		• Required for major projects that have the potential to cause significant adverse impacts • Project must undergo interagency review • Opportunity for public comment • Opportunity for 401 certification review
• Cover 36 types of activities that the COE determines to have minimal adverse impacts on the environment	• Developed by COE District Offices to cover activities in a specified region	**State Programmatic Permits**	**Others**	
		• COE defers permit decisions to State agency while reserving authority to require an individual permit	• Special Management Agencies • Watershed Planning Commissions	

Under a programmatic general permit, the COE defers its permit decision to the regulating entity but reserves its authority to require an individual permit.

Currently, the COE and EPA are promoting the development of State programmatic general permits (SPGPs) to increase State involvement in wetlands protection and minimize duplicative State and Federal review of activities proposed in wetlands. Each SPGP is a unique arrangement developed by a State and the COE to take advantage of the strengths of the individual State wetlands program. Several States have adopted comprehensive SPGPs that replace many or all COE-issued nationwide general permits. SPGPs simplify the regulatory process and increase State control over their wetlands resources. Carefully developed SPGPs can improve wetlands protection while reducing regulatory demands on landowners.

Water quality standards for wetlands ensure that the provisions of CWA Section 303 that apply to other surface waters are also applied to wetlands. In July 1990, EPA issued guidance to States for the development of wetlands water quality standards. Water quality standards consist of designated beneficial uses, numeric criteria, narrative criteria, and antidegradation statements. Figure 20 indicates the State's progress in developing these standards.

Standards provide the foundation for a broad range of water quality management activities under the CWA including, but not limited to, monitoring for the Section 305(b) report, permitting under Section 402 and 404, water quality certification under Section 401, and the control of nonpoint source pollution under Section 319.

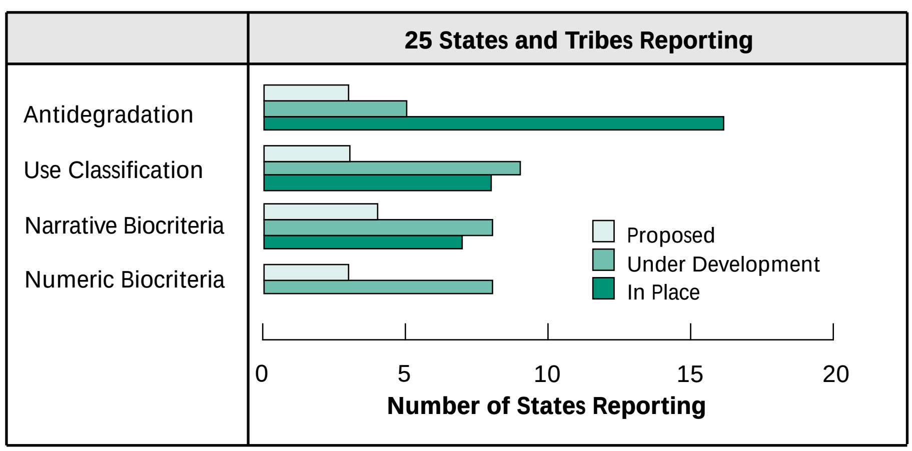
States, Territories, and Tribes are well positioned between Federal and local government to take the lead in integrating and expanding wetlands protection and management programs. They are experienced in managing federally mandated environmental programs, and they are uniquely equipped to help resolve local and regional conflicts and identify the local economic and geographic factors that may influence wetlands protection.

Section 401 of the CWA gives States and eligible American Indian Tribes the authority to grant, condition, or deny certification of federally permitted or licensed activities that may result in a discharge to U.S. waters, including wetlands. Such activities include discharge of dredged or fill material permitted under CWA Section 404, point source discharges permitted under CWA Section 402, and Federal Energy Regulatory Commission's hydropower licenses. States review these permits to ensure that they meet State water quality standards.

Section 401 certification can be a powerful tool for protecting wetlands from unacceptable degradation or destruction especially when implemented in conjunction with wetlands-specific water quality standards. If a State or an eligible Tribe denies Section 401 certification, the Federal permitting or licensing agency cannot issue the permit or license.

Until recently, many States waived their right to review and certify Section 404 permits because these States had not defined water

Figure 20. Development of State Water Quality Standards for Wetlands



quality standards for wetlands or codified regulations for implementing their 401 certification program into State law. Now, most States report that they use the Section 401 certification process to review Section 404 projects and to require mitigation if there is no alternative to degradation of wetlands. Ideally, 401 certification should be used to augment State programs because activities that do not require Federal permits or licenses, such as some ground water withdrawals, are not covered.

State Wetlands Conservation Plans (SWCPs) are strategies that integrate regulatory and cooperative approaches to achieve State wetlands management goals, such as no overall net loss of wetlands. SWCPs are not meant to create a new level of bureaucracy. Instead, SWCPs improve government and private-sector effectiveness and efficiency by identifying gaps in wetlands protection programs and identifying opportunities to improve wetlands programs.

States, Tribes, and other jurisdictions protect their wetlands with a variety of other approaches, including permitting programs, coastal management programs, wetlands acquisition programs, natural heritage programs, and integration with other programs. The following trends emerged from individual State and Tribal reporting:

- Most States have defined wetlands as waters of the State, which offers general protection through antidegradation clauses and designated uses that apply to all waters of a State. However, most States have not developed specific wetlands water quality standards and designated uses that protect wetlands' unique functions, such as flood attenuation and filtration.

- Without specific wetlands uses and standards, the Section 401 certification process relies heavily on antidegradation clauses to prevent significant degradation of wetlands.

- In many cases, the States use the Section 401 certification process to add conditions to Section 404 permits that minimize the size of wetlands destroyed or degraded by proposed activities to the extent practicable. States often add conditions that require compensatory mitigation for destroyed wetlands, but the States do not have the resources to perform enforcement inspections or followup monitoring to ensure that the wetlands are constructed and functioning properly.

- More States are monitoring selected, largely unimpacted wetlands to establish baseline conditions in healthy wetlands. The States will use this information to monitor the relative performance of constructed wetlands and to help establish biocriteria and water quality standards for wetlands.

Although the States, Tribes, and other jurisdictions report that they are making progress in protecting wetlands, they also report that the pressure to develop or destroy wetlands remains high. EPA and the States, Tribes, and other jurisdictions will continue to pursue new mechanisms for protecting wetlands that rely less on regulatory tools.

Protecting the Great Lakes

Restoring and protecting the Great Lakes requires cooperation from numerous organizations because the pollutants that enter the Great Lakes originate in both the United States and Canada, as well as in other countries. The International Joint Commission (IJC), established by the 1909 Boundary Waters Treaty, provides a framework for the cooperative management of the Great Lakes. Representatives from the United States and Canada, the Province of Ontario, and the eight States bordering the Lakes sit on the IJC's Water Quality Board. The Water Quality Board recommends actions for protecting and restoring the Great Lakes and evaluates the environmental policies and actions implemented by the United States and Canada.

The EPA Great Lakes National Program Office (GLNPO) coordinates Great Lakes management activities conducted by all levels of government within the United States. The GLNPO also works with nongovernmental organizations to protect and restore the Lakes. The GLNPO provides leadership through its annual Great Lakes Program Priorities and Funding Guidance. The GLNPO also serves as a liaison to the Canadian members of the IJC and the Canadian environmental agencies.

The 1978 Great Lakes Water Quality Agreement (as amended in 1987) lay the foundation for ongoing efforts to restore and protect the Great Lakes. The Agreement committed the United States and Canada to developing Remedial Action Plans (RAPs) for Areas of Concern and Lakewide Management Plans (LaMPs) for each Lake. Areas of Concern are specially designated waterbodies around the Great Lakes that show symptoms of serious water quality degradation. Most of the 42 Areas of Concern are located in harbors, bays, or river mouths entering the Great Lakes. RAPs identify impaired uses and examine management options for addressing degradation in an Area of Concern. LaMPs use an ecosystem approach to examine water quality issues that have more widespread impacts within each Great Lake. Public involvement is a critical component of both LaMP development and RAP development.

EPA advocates pollution prevention as the most effective approach for achieving the virtual elimination of persistent toxic discharges into the Great Lakes. The GLNPO has funded numerous pollution prevention grants throughout the Great Lakes Basin during the past 3 years. EPA and the States also implemented the 38/50 Program in the Great Lakes Basin, under which EPA received voluntary commitments from industry to reduce the emission of 17 priority pollutants by 50% by the end of 1995. In addition, EPA, the States, and Canada are implementing a virtual elimination initiative for Lake Superior. The first phase of the initiative seeks to eliminate new contributions of mercury.


Julie Fountain, Youngsville, NC

The Great Lakes Water Quality Initiative is a key element of the environmental protection efforts undertaken by the United States in the Great Lakes Basin. The purpose of the Initiative is to provide a consistent level of protection in the Basin from the effects of toxic pollutants. In 1989, the Initiative was organized by EPA at the request of the Great Lakes States to promote consistency in their environmental programs in the Great Lakes Basin with minimum requirements.

Initiative efforts were well under way when Congress enacted the Great Lakes Critical Programs Act of 1990. The Act requires EPA to publish proposed and final water quality guidance that specifies minimum water quality criteria for the Great Lakes System. The Act also requires the Great Lakes States to adopt provisions that are consistent with the EPA final guidance within 2 years of EPA's publication. In addition, Indian Tribes authorized to administer an NPDES program in the Great Lakes Basin must also adopt provisions consistent with EPA's final guidance.

To carry out the Act, EPA proposed regulations for implementing the guidance on April 16, 1993, and invited the public to comment. The States and EPA conducted public meetings in all of the Great Lakes States during the comment period. As a result, EPA received over 26,500 pages of comments from over 6,000 commenters. EPA reviewed all of the comments and published the final guidance in March of 1995.

The final guidance prioritizes control of long-lasting pollutants that accumulate in the food web—bioaccumulative chemicals of concern (BCCs). The final guidance includes provisions to phase out mixing zones for BCCs (except in limited circumstances), more extensive data requirements to ensure that BCCs are not underregulated due to a lack of data, and water quality criteria to protect wildlife that feed on aquatic prey. Publication of the final guidance is a milestone in EPA's move toward increasing stakeholder participation in the development of innovative and comprehensive programs for protecting and restoring our natural resources.

The Chesapeake Bay Program

In many areas of the Chesapeake Bay, the quality is not sufficient to support living resources year round. In the warmer months, large portions of the Bay contain little or no dissolved oxygen. Low oxygen conditions may cause fish eggs and larvae to die. The growth and reproduction of oysters, clams, and other bottom-dwelling animals are impaired. Adult fish find their habitat reduced and their feeding inhibited.

Many areas of the Bay also have cloudy water from excess sediment in the water or an overgrowth of algae (stimulated by excessive nutrients in the water). Turbid waters block the sunlight needed to support the growth and survival of Bay grasses, also known as submerged aquatic vegetation (SAV). Without SAV, critical habitat for fish and crabs is lost. Although there has been a recent resurgence of SAV in some areas of the Bay, most areas still do not support abundant populations as they once did.

The main causes of the Bay's poor water quality and aquatic habitat loss are elevated levels of the nutrients nitrogen and phosphorus. Both are natural fertilizers found in animal wastes, soil, and the atmosphere. These nutrients have always existed in the Bay, but not at the present elevated concentrations. When the Bay was surrounded primarily by forests and wetlands, very little nitrogen and phosphorus ran off the land into the water. Most of it was absorbed or held in place by the natural vegetation. As the use of the land has changed and the watershed's population has grown, the amount of nutrients entering the Bay has increased tremendously.

Now in its twelfth year, the Chesapeake Bay Program is a regional partnership of Federal, State, and local participants that has directed and coordinated restoration of the Bay since the signing of the historic 1983 Chesapeake Bay Agreement. Maryland, Pennsylvania, Virginia, the District of Columbia, the Chesapeake Bay Commission, EPA, and advisory groups form the partnership. The Chesapeake Executive Council provides leadership for the Bay Program and establishes program policies to restore and protect the Bay and its living resources. The Council consists of the governors of Maryland, Virginia, and Pennsylvania, the mayor of the District of Columbia, the administrator of EPA, and the chairperson of the Chesapeake Bay Commission.

Considered a national and international model for estuarine restoration and protection programs, the Chesapeake Bay Program is still a "work in progress." Since 1983, milestones in the evolution of the program include the 1987 Chesapeake Bay Agreement and the 1992 amendments to the Agreement. The 1987 Agreement set a goal to reduce the quantity of nutrients entering the Bay by 40% by the year 2000. In the 1992 amendments to the Agreement, the partners reaffirmed the 40% nutrient reduction goal, agreed to cap nutrient loadings beyond the year 2000, and agreed to attack nutrients at their source by applying the 40% reduction goal to the 10 major tributaries of the Bay. The amendments also stressed managing the Bay as a whole ecosystem. The amendments also spell out the importance of reducing atmospheric sources of nutrients and broadening regional interstate cooperation.

Protection and restoration of forests is a critical component of the Chesapeake Bay Program because scientific data clearly show that forests are the most beneficial land cover for maintaining clean water, especially forests alongside waterbodies in the riparian zone. Through the Chesapeake Bay Program, unique partnerships have been formed among the Bay region's forestry agencies, forest managers, and interested citizen groups. Since 1990, the U.S. Forest Service has assigned a Forestry Program Coordinator to the Chesapeake Bay Program to assist both the EPA and Bay Program committees in developing strategies and projects that will contribute to the Bay restoration goals. A Forestry Work Group, formed under the Nonpoint Source Subcommittee, raises and addresses issues related to forests and the practice of forestry in the watershed.

In addition, State foresters and local governments have developed and implemented numerous programs and projects aimed at the protection and restoration of forests. Forestry incentive programs in all of the Bay States have resulted in the planting of millions of trees, the restoration of nearly 50 miles of riparian forest, the development of stewardship plans, and forest enhancement projects on thousands of acres within the Bay watershed.

On the positive side, the extent of Bay grasses has increased by 75% since 1978. The current extent of SAV attains 64% of the goal established by the Chesapeake Bay Program. Striped bass, or rockfish, have made a remarkable recovery over the past decade due to improved reproduction and better control of the harvest. There has been a modest increase in the number of American shad returning to the Bay to spawn. Controls on the harvest of American shad, creation of fish passages at blockages, stocking programs, and habitat restoration are expected to yield increases in the American shad population and similar fish species that inhabit the Bay during part of their life cycle.

Phosphorus levels continue to decline and, after many years of increasing nitrogen concentrations, most of the Bay's tributaries are showing a leveling off of this trend. Some tributaries are showing declining trends in nitrogen concentrations. These trends indicate that both point and nonpoint source pollution abatement programs are working.

Despite the promising trends in nutrient concentrations, oxygen concentrations are still low enough to cause severe impacts or stressful conditions in the mainstem of the Bay and several larger tributaries. Prospects for the Bay's oyster populations remain poor. Overharvesting, habitat loss, and disease have severely depleted oyster stocks. New management efforts have been developed to improve this situation.

Chesapeake Bay Foundation, Richmond, VA

The blue crab is currently the most important commercial and recreational fishery in the Bay. There is growing concern about the health of the blue crab population due to increasing harvesting pressures and relatively low harvests in recent years. Both Maryland and Virginia have recently implemented new regulations on commercial and recreational crabbers to protect this important resource.

Overall, the Chesapeake Bay still shows symptoms of stress from an expanding population and changes in land use. However, conditions in the Chesapeake Bay have improved since the Chesapeake Bay Program was launched, and continuation of the Program promises an even brighter future for the Bay.

The Gulf of Mexico Program

The Gulf of Mexico Program (GMP) was established in 1988 with EPA as the lead Federal agency in response to signs of long-term environmental damage throughout the Gulf's coastal and marine ecosystem. The main purpose of the GMP is to develop and help implement a strategy to protect, restore, and maintain the health and productivity of the Gulf. The GMP is a grass roots program that serves as a catalyst to promote sharing of information, pooling of resources, and coordination of efforts to restore and reclaim wetlands and wildlife habitat, clean up existing pollution, and prevent future contamination and destruction of the Gulf. The GMP mobilizes State, Federal, and local government; business and industry;

academia; and the community at large through public awareness and information dissemination programs, forum discussions, citizen committees, and technology applications.

A Policy Review Board and the Management Committee determine the scope and focus of GMP activities. The program also receives input from a Technical Advisory Committee and a Citizen's Advisory Committee. The GMP Office, eight technical issue committees, and the operations and support committees coordinate the collection, integration, and reporting of pertinent data and information. The issue committees are composed of individuals from Federal, State, and local agencies and from industry, science, education, business, citizen groups, and private organizations.

The issue committees are responsible for documenting environmental problems and management goals, available resources, and potential solutions for a broad range of issues, including habitat degradation, public health, freshwater inflow, marine debris, shoreline erosion, nutrient enrichment, toxic pollutants, and living aquatic resources. The issue committees publish their findings in Action Agendas.

On December 10, 1992, the Governors of Alabama, Florida, Louisiana, Mississippi, and Texas; EPA; the Chair of the Citizen's Advisory Committee; and representatives of 10 other Federal agencies signed the Gulf of Mexico Program Partnership for Action agreement for protecting, restoring, and enhancing the Gulf of Mexico and adjacent lands. The agreement committed the signatory agencies to pledge their efforts, over 5 years, to obtain the knowledge and resources to:

- Significantly reduce the rate of loss of coastal wetlands
- Achieve an increase in Gulf Coast seagrass beds
- Enhance the sustainability of Gulf commercial and recreational fisheries
- Protect human health and food supply by reducing input of nutrients, toxic substances, and pathogens to the Gulf
- Increase Gulf shellfish beds available for safe harvesting by 10%
- Ensure that all Gulf beaches are safe for swimming and recreational uses
- Reduce by at least 10% the amount of trash on beaches
- Improve and expand coastal habitats that support migratory birds, fish, and other living resources
- Expand public education/outreach tailored for each Gulf Coast county or parish
- Reduce critical coastal and shoreline erosion.

Beginning in 1992, the GMP also launched Take-Action Projects in each of the five Gulf States to demonstrate that program strategies and methods could achieve rapid results. The Take-Action Projects primarily address inadequate sewage treatment, pollution prevention, and habitat protection and restoration. Several projects aim to demonstrate the effectiveness of innovative sewage treatment technologies to control pathogenic contamination of shellfish harvesting areas. Other projects aim to restore wetlands, sea grass beds, and oyster reefs. The Take-Action Projects are designed to have Gulf-wide application.

Take-Action Projects in the five Gulf States primarily address sewage treatment, pollution prevention, and habitat protection and restoration.

Since 1992, EPA has streamlined and restructured its management scheme for the GMP to increase Regional involvement and better meet the needs of the 5-year environmental challenges. The GMP has also expanded efforts to integrate Mexico and the Caribbean Islands into management of the Gulf. These activities include technology transfer and development of international agreements that prohibit the discharge of ship-generated wastes and plastics into waters of the Gulf and Caribbean Sea.

Jeff Reynolds, Raleigh, NC

Ground Water Protection Programs

The sage adage that "An ounce of prevention is worth a pound of cure" is being borne out in the field of ground water protection. Studies evaluating the cost of prevention versus the cost of cleaning up contaminated ground water have found that there are real cost advantages to promoting protection of our Nation's ground water resources.

Numerous laws, regulations, and programs play a vital role in protecting ground water. The following Federal laws and programs enable, or provide incentives for, EPA and/or States to regulate or voluntarily manage and monitor sources of ground water pollution:

- The Resource Conservation and Recovery Act (RCRA) addresses the problem of safe disposal of the huge volumes of solid and hazardous waste generated nationwide each year. RCRA is part of EPA's comprehensive program to protect ground water resources through the development of regulations and methods for handling, storing, and disposing of hazardous material and through the regulation of underground storage tanks—the most frequently cited source of ground water contamination.

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulates the restoration of contaminated ground water at abandoned hazardous waste sites.

- The Safe Drinking Water Act (SDWA) regulates subsurface injection of fluids that can contaminate ground water.

- The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) controls the use and disposal of pesticides, some of which have been detected in ground water wells in rural communities.

- The Toxic Substances Control Act (TSCA) controls the use and disposal of additional toxic substances, thereby minimizing their entry into ground water. Other Federal laws establish State grants that may be used to protect ground water.

- Clean Water Act Sections 319(h) and (i) and 518 provide funds to State agencies to implement EPA-approved nonpoint source management programs that include ground water protection activities. Several States have developed programs that focus on ground water contamination resulting from agriculture and septic tanks.

Comprehensive State Ground Water Protection Programs

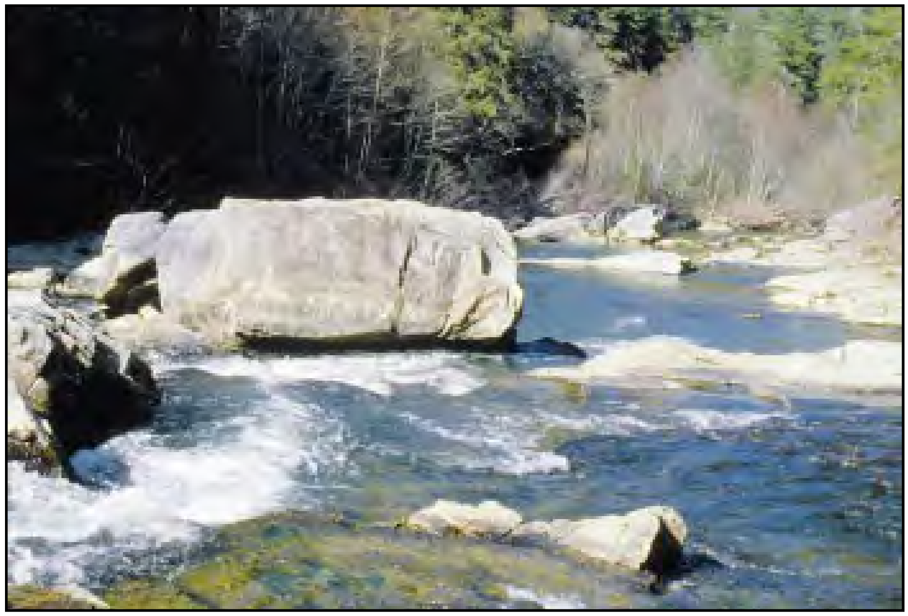
A Comprehensive State Ground Water Protection Program (CSGWPP) is composed of six "strategic activities." They are:

- Establishing a prevention-oriented goal
- Establishing priorities, based on the characterization of the resource and identification of sources of contamination
- Defining roles, responsibilities, resources, and coordinating mechanisms
- Implementing all necessary efforts to accomplish the State's ground water protection goal
- Coordinating information collection and management to measure progress and reevaluate priorities
- Improving public education and participation.

■ The Pollution Prevention Act of 1990 allows grants for research projects to demonstrate agricultural practices that emphasize ground water protection and reduce the excessive use of fertilizers and pesticides.

Comprehensive State Ground Water Protection Programs (CSGWPPs) attempt to combine all of the above efforts and emphasize contamination prevention.

Comprehensive State ground water protection programs support State-directed priorities in resource protection.


John Theilgard, Bynum, NC

CSGWPPs improve coordination of Federal, State, Tribal, and local ground water programs and enable distribution of resources to established priorities.

Another means of protecting our Nation's ground water resources is through the implementation of Wellhead Protection Plans. EPA's Office of Ground Water and Drinking Water is supporting the development and implementation of Wellhead Protection Plans at the local level through many efforts. For example, EPA-funded support is provided through the National Rural Water Association Ground Water/Wellhead Protection programs. At the conclusion of the first 4 years of this program, over 2,000 communities in 26 States were actively involved in protecting their water supplies by implementing wellhead protection programs. These 2,000 communities represent almost 4 million people in the rural areas of the United States who will have better-protected water supplies.

Recognizing the importance and cost-effectiveness of protecting our Nation's ground water resources, States are participating in numerous activities to prevent future impairments of the resource. These activities include enacting legislation aimed at the development of comprehensive State ground water protection programs and promulgating protection regulations. More than 80% of the States indicate that they have current or pending legislation geared specifically to ground water protection. Generally, State legislation focuses on the need for program development, increased data collection, and public education programs. In addition, States also may mandate strict technical controls such as discharge permits, underground storage tank registrations, and protection standards.

All of these programs are intended to provide protection to a valuable, and often vulnerable, resource. Through the promotion of ground water protection on both State and Federal levels, our Nation's ground water resources will be safeguarded against contamination, thereby protecting human health and the environment.

What You Can Do

Federal and State programs have helped clean up many waters and slow the degradation of others. But government alone cannot solve the entire problem, and water quality concerns persist. Nonpoint source pollution, in particular, is everybody's problem, and everybody needs to solve it.

Examine your everyday activities and think about how you are contributing to the pollution problem. Here are some suggestions on how you can make a difference.

Be Informed

You should learn about water quality issues that affect the communities in which you live and work. Become familiar with your local water resources. Where does your drinking water come from? What activities in your area might affect the water you drink or the rivers, lakes, beaches, or wetlands you use for recreation?

Learn about procedures for disposing of harmful household wastes so they do not end up in sewage treatment plants that cannot handle them or in landfills not designed to receive hazardous materials.

Be Responsible

In your yard, determine whether additional nutrients are needed before you apply fertilizers, and look for alternatives where fertilizers might run off into surface waters. Consider selecting plants and grasses that have low maintenance requirements. Water your lawn conservatively. Preserve existing trees and plant new trees and shrubs to help prevent erosion and promote infiltration of water into the soil. Restore bare patches in your lawn to prevent erosion. If you own or manage land through which a stream flows, you may wish to consult your local county extension office about methods of restoring stream banks in your area by planting buffer strips of native vegetation.

John Theilgard, Bynum, NC

Around your house, keep litter, pet waste, leaves, and grass clippings out of gutters and storm drains. Use the minimum amount of water needed when you wash your car. Never dispose of any household, automotive, or gardening wastes in a storm drain. Keep your septic tank in good working order.

Within your home, fix any dripping faucets or leaky pipes and install water-saving devices in shower heads and toilets. Always follow directions on labels for use and disposal of household chemicals. Take used motor oil, paints, and other hazardous household materials to proper disposal sites such as approved service stations or designated landfills.

Be Involved

As a citizen and a voter there is much you can do at the community level to help preserve and protect our Nation's water resources. Look around. Is soil erosion being controlled at construction sites? Is the community sewage plant being operated efficiently and correctly? Is the community trash dump in or along a stream? Is road deicing salt being stored properly?

Become involved in your community election processes. Listen and respond to candidates' views on water quality and environmental issues. Many communities have recycling programs; find out about them, learn how to recycle, and volunteer to help out if you can. One of the most important things you can do is find out how your community protects water quality, and speak out if you see problems.

Volunteer Monitoring: You Can Become Part of the Solution

In many areas of the country, citizens are becoming personally involved in monitoring the quality of our Nation's water. As a volunteer monitor, you might be involved in taking ongoing water quality measurements, tracking the progress of protection and restoration projects, or reporting special events, such as fish kills and storm damage.

Volunteer monitoring can be of great benefit to State and local governments. Some States stretch their monitoring budgets by using data collected by volunteers, particularly in remote areas that otherwise might not be monitored at all. Because you are familiar with the water resources in your own neighborhood, you are also more likely to spot unusual occurrences such as fish kills.

The benefits to you of becoming a volunteer are also great. You will learn about your local water resources and have the opportunity to become personally involved in a nationwide campaign to protect a vital, and mutually shared, resource. If you would like to find out more about organizing or joining volunteer monitoring programs in your State, contact your State department of environmental quality, or write to:

Alice Mayio
Volunteer Monitoring
  Coordinator
U.S. EPA (4503F)
401 M St. SW
Washington, DC 20460
(202) 260-7018

For further information on water quality in your State or other jurisdiction, contact your Section 305(b) coordinator listed in Section III. Additional water quality information may be obtained from the Regional offices of the U.S. Environmental Protection Agency (see inside back cover).

Jimmy Crawford, Raleigh, NC

For Further Reading

Volunteer Monitoring. EPA-800-F-93-008. September 1993. A brief fact sheet about volunteer monitoring, including examples of how volunteers have improved the environment.

Starting Out in Volunteer Water Monitoring. EPA-841-B-92-002. August 1992. A brief fact sheet about how to become involved in volunteer monitoring.

National Directory of Citizen Volunteer Environmental Monitoring Programs, Fourth Edition. EPA-841-B-94-001. January 1994. Contains information about 519 volunteer monitoring programs across the Nation.

Volunteer Stream Monitoring: A Methods Manual. EPA-841-D-95-001. 1995. Presents information and methods for volunteer monitoring of streams.

Volunteer Estuary Monitoring: A Methods Manual. EPA-842-B-93-004. December 1993. Presents information and methods for volunteer monitoring of estuarine waters.

Volunteer Lake Monitoring: A Methods Manual. EPA-440/4-91-002. December 1991. Discusses lake water quality issues and methods for volunteer monitoring of lakes.

Many of these publications can also be accessed through EPA's Water Channel on the Internet. From the World Wide Web or Gopher, enter **http://www.epa.gov/OWOW** to enter WIN and locate documents.

Fish Consumption Advisories

States issue fish consumption advisories to protect the public from ingesting harmful quantities of toxic pollutants in contaminated fish and shellfish. Fish may accumulate dangerous quantities of pollutants in their tissues by ingesting many smaller organisms, each contaminated with a small quantity of pollutant. This process is called bioaccumulation or biomagnification. Pollutants also enter fish and shellfish tissues through the gills or skin.

Fish consumption advisories recommend that the public limit the quantity and frequency of consumption of fish caught in specific waterbodies. The States tailor individual advisories to minimize health risks based on contaminant data collected in their fish tissue sampling programs. Advisories may completely ban fish consumption in severely polluted waters, or limit fish 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, and nursing mothers), specific fish species, or larger fish that may have accumulated high concentrations of a pollutant over a longer lifetime than a smaller, younger fish.

The EPA fish consumption advisory database tracks advisories issued by each State. For 1994, the database listed 1,531 fish consumption advisories in effect in 49 States. Fish consumption advisories are unevenly distributed among the

Chesapeake Bay Foundation, Richmond, VA

States because the States use their own criteria to determine if fish tissue concentrations of toxics pose a health risk that justifies an advisory. States also vary the amount of fish tissue monitoring they conduct and the number of pollutants analyzed. States that conduct more monitoring and use strict criteria will issue more advisories than States that conduct less monitoring and use weaker criteria. For example, 62% of the advisories active in 1994 were issued by the States surrounding the Great Lakes, which support extensive fish sampling programs and follow strict criteria for issuing advisories.

Most of the fish consumption advisories (73%) are due to mercury. The other pollutants most commonly detected in elevated concentrations in fish tissue samples are polychlorinated biphenyls (PCBs), chlordane, dioxins, and DDT (with its byproducts).

Many coastal States report restrictions on shellfish harvesting in estuarine waters. Shellfish–particularly oysters, clams, and mussels–are filter-feeders that extract their food from water. Waterborne bacteria and viruses may also accumulate on their gills and mantles and in their digestive systems. Shellfish contaminated by these microorganisms are a serious human health concern, particularly if consumed raw.

States currently sample water from shellfish harvesting areas to measure indicator bacteria, such as total coliform and fecal coliform bacteria. These bacteria serve as indicators of the presence of potentially pathogenic microorganisms associated with untreated or undertreated sewage. States restrict shellfish harvesting to areas that maintain these bacteria at concentrations in sea water below established health limits.

In 1994, 15 States reported that shellfish harvesting restrictions were in effect for more than 6,052 square miles of estuarine and coastal waters during the 1992-1994 reporting period. Six States reported that urban runoff and storm sewers, municipal wastewater treatment facilities, nonpoint sources, marinas, industrial discharges, CSOs, and septic tanks restricted shellfish harvesting.

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 1994 Section 305(b) reports.

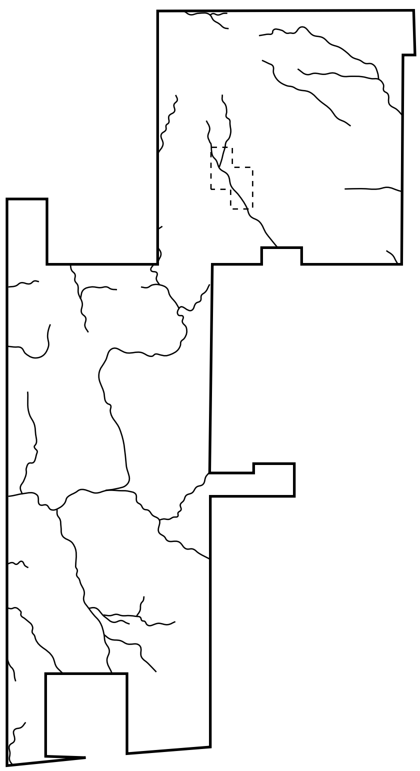
Barry Burgan, U.S. EPA

Tribal Summaries

This section provides individual summaries of the water quality survey data reported by six American Indian Tribes in their 1994 Section 305(b) reports. Tribal participation in the Section 305(b) process grew from two Tribes in 1992 to six Tribes during the 1994 reporting cycle, but Tribal water quality remains unrepresented in this report for the hundreds of other Tribes established 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.

Phil Johnson, U.S. EPA Region 8

Campo Indian Reservation



Location of Reservation

For a copy of the Campo Indian Reservation 1994 305(b) report, contact:

Stephen W. Johnson
Michael L. Connolly
Campo Environmental Protection Agency
36190 Church Road, Suite #4
Campo, CA 91906
(619) 478-9369

Surface Water Quality

The Campo Indian Reservation covers 24.2 square miles in southeastern San Diego County, California. The Campo Indian Reservation has 31 miles of intermittent streams, 80 acres of freshwater wetlands, and 10 lakes with a combined surface area of 3.5 acres.

The natural water quality of Tribal streams, lakes, and wetlands ranges from good to excellent. There are no point source discharges within or upstream of the Reservation, but grazing livestock have degraded streams, lakes, and wetlands with manure containing fecal coliform bacteria, nutrients, and organic wastes. Livestock also trample streambeds and riparian habitats. Septic tanks and construction also threaten water quality.

Ground Water Quality

Ground water supplies 100% of the domestic water consumed on the Campo Indian Reservation. Nitrate and bacteria from nonpoint sources occasionally exceed drinking water standards in some domestic wells. The proximity of individual septic systems to drinking water wells poses a human health risk because Reservation soils do not have good purification properties. Elevated iron and manganese levels may be due to natural weathering of geologic materials.

Programs to Restore Water Quality

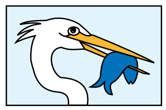
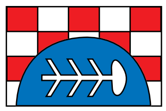
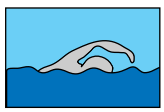
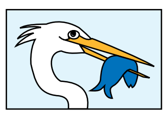
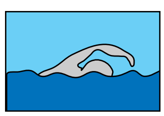
The Campo Environmental Protection Agency (CEPA) has authority to administer three Clean Water Act programs. The Section 106 Water Pollution Control Program supports infrastructure, the 305(b) assessment process, and development of a Water Quality Management Plan. The Tribe is inventorying its wetlands with funding from the Section 104(b)(3) State Wetlands Protection Program. The Tribe has used funding from the Section 319 Nonpoint Source Program to stabilize stream banks, construct sediment retention structures, and fence streams and riparian zones to exclude livestock. CEPA will promulgate water quality standards in 1995 that will establish beneficial uses, water quality criteria, and antidegradation provisions for all Tribal waters.

In 1994, the General Council passed a resolution to suspend cattle grazing on the Reservation for at least 2 years and to concurrently restore degraded recreational water resources by creating fishing and swimming ponds for Tribal use.

Programs to Assess Water Quality

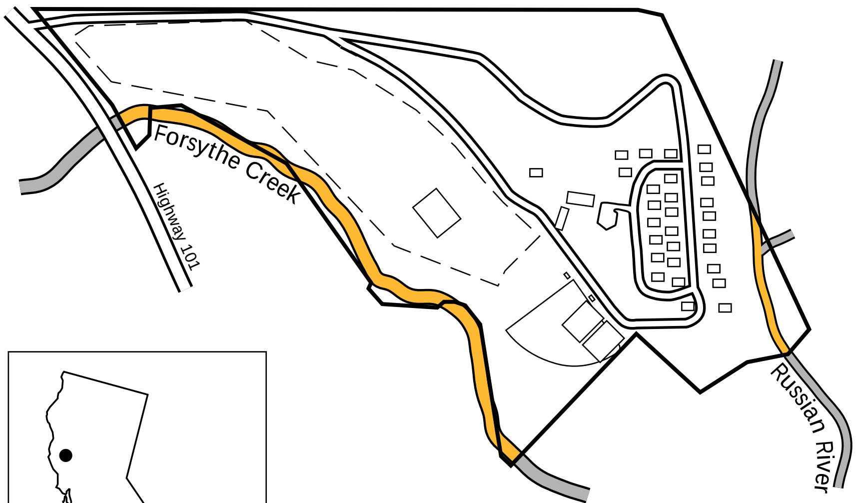
Streams, wetlands, and lakes on Tribal lands were not monitored until CEPA initiated its Water Pollution Control Program in 1992. Following EPA approval of CEPA's Quality Assurance Project Plan in May 1993, CEPA conducted short-term intensive surveys to meet the information needs of the 305(b) assessment process. Based on the results of the 1994 305(b) assessment, CEPA will develop a long-term surface water monitoring program for implementation in 1995. CEPA will consider including biological monitoring, physical and chemical monitoring, monthly bacterial monitoring in lakes, toxicity testing, and fish tissue monitoring in its monitoring program.

Individual Use Support in Campo Indian Reservation

Designated Use[a]		Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Poor (Not Attainable)
Rivers and Streams (Total Miles = 31)[b]	Total Miles Assessed					
	22	0	0	100	0	0
	<1	100	0	0	0	0
	16	0	0	100	0	0
Lakes (Total Acres = 3.5)	Total Acres Assessed					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

[a] A subset of Campo Indian 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.

Coyote Valley Reservation



Location of Reservation

For a copy of the Coyote Valley Reservation 1994 305(b) report, contact:

Jean Hunt or Eddie Knight
The Coyote Valley Reservation
P.O. Box 39
Redwood Valley, CA 95470

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 to irrigate a walnut orchard. 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.

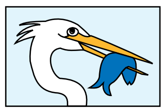
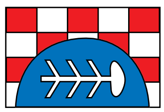
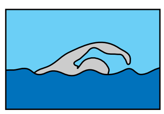
Programs to Restore Water Quality

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

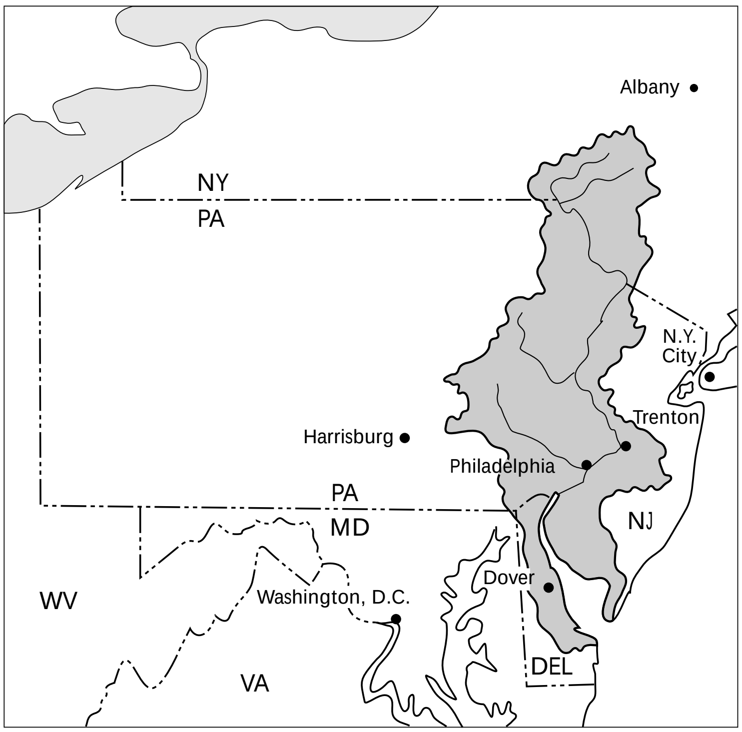
The Tribal Water Quality Manager will design a monitoring system with assistance from environmental consultants. The Water Quality Manager will sample a temporary monitoring station on Forsythe Creek and a proposed sampling station on the Russian River every month. A fisheries biologist will survey habitat on the rivers every other year, as funding permits.

Individual Use Support in Coyote Valley Reservation

Designated Use[a]	Total Miles Assessed	Percent: 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	77	0	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.

Delaware River Basin Commission



— Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Delaware River Basin Commission 1994 305(b) report, contact:

Robert Kausch
Delaware River Basin Commission
P.O. Box 7360
West Trenton, NJ 08628-0360
(609) 883-9500, ext. 252

Surface Water Quality

The Delaware River Basin covers portions of Delaware, New Jersey, New York, and Pennsylvania. The Delaware River system consists of a 207-mile freshwater segment, an 85-mile tidal reach, and the 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 94% of the estuarine waters in the Basin have good water quality that fully supports aquatic life uses. Three percent of the riverine waters do not support fish consumption and 2% have fair quality that partially supports swimming. In estuarine waters, poor water quality impairs shellfishing in 29% of the surveyed waters. Low dissolved oxygen concentrations and toxic contaminants in sediment degrade portions of the lower tidal river and estuary. Fecal coliform bacteria and high pH values impair a few miles of the Delaware River. As of April 1994, fish consumption advisories were posted on about 6 miles of the Delaware River and 22 square miles of the tidal river, cautioning the public to restrict consumption of channel catfish, white perch, and American eels contaminated with PCBs and chlordane.

In general, water quality has improved since the 1992 305(b) assessment period. Tidal river oxygen levels were higher during the critical summer period, residues of toxic chemicals in fish and shellfish declined, and populations of important fish species (such as striped bass and American shad) increased during the 1994 assessment period.

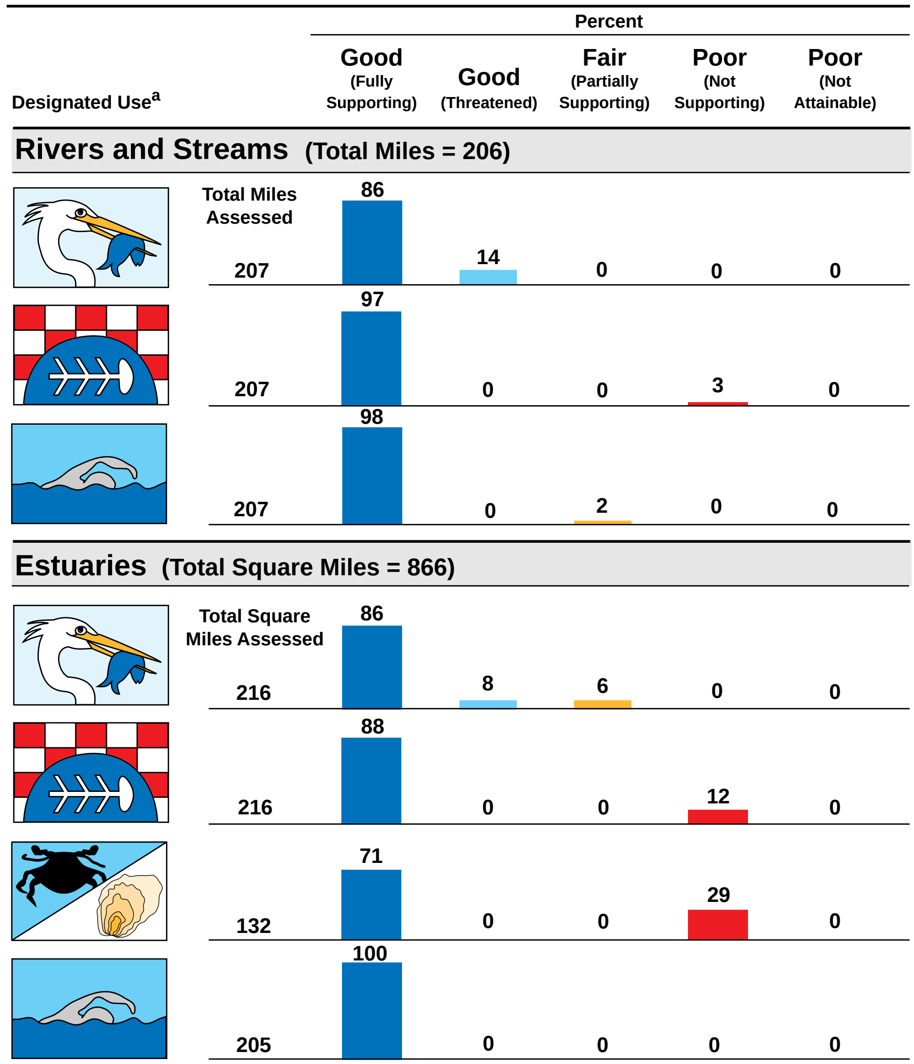
Programs to Restore Water Quality

For many years, the Delaware River Basin Commission and the surrounding States have implemented an aggressive program to reduce point source discharges of oxygen-depleting wastes and other pollutants. These programs will continue, in addition to new efforts to determine the role of stormwater runoff. The Commission also adopted new Special Protection Waters regulations to protect existing high water quality in the upper reaches of the nontidal river from the effects of future population growth and development. The Commission also promotes a comprehensive watershed management approach to coordinate several layers of governmental regulatory programs impacting the Delaware River Basin.

Programs to Assess Water Quality

The Commission 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, located about 7 miles apart. The new Special Protection Waters regulations require even more sophisticated monitoring and modeling, such as biological monitoring and continuous water quality monitoring. The Combined Sewer Overflow Study and the Toxics Study will both require additional specialized water quality analyses in order to understand how and why water quality is affected. New management programs will very likely require customized monitoring programs.

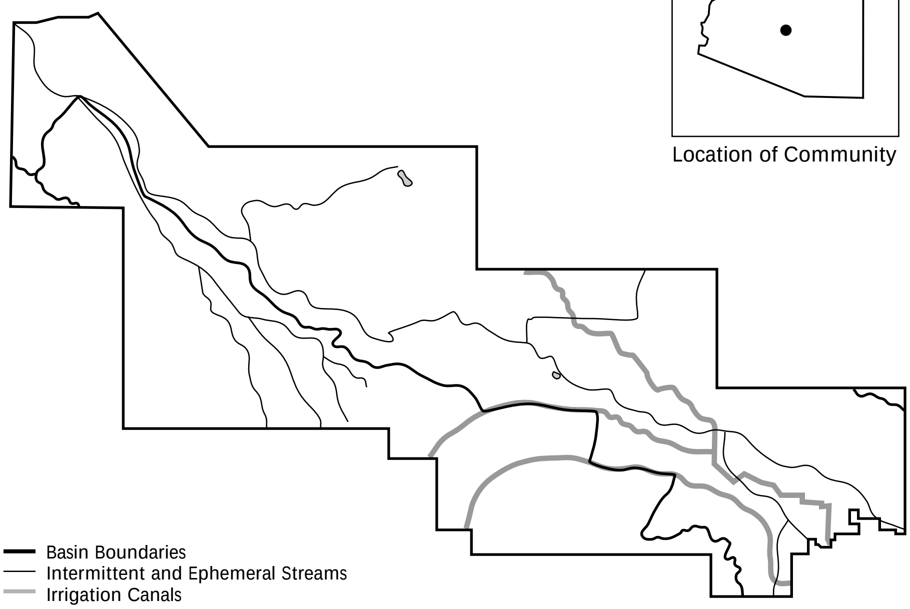
Individual Use Support in the Delaware River Basin



[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.

Gila River Indian Community

Location of Community



For a copy of the Gila River Indian Community 1994 305(b) report, contact:

Errol Blackwater
Gila River Indian Community
Water Quality Planning Office
Corner of Pima and Main Streets
Sacaton, AZ 85247
(602) 562-3203

Surface Water Quality

The Gila River Indian Community occupies 580 square miles in Central Arizona adjacent to the metropolitan Phoenix area. About 8,500 members of the Pima and Maricopa Tribes live in 22 small villages inside the Community. The Gila River is the major surface water feature in the Community, but its flow is interrupted by upstream diversions outside of the Community. Arid conditions and little vegetative cover cause sudden runoff with high suspended sediment loads.

Surface water was evaluated with qualitative information due to the lack of monitoring data. Most of the Community's surface waters have fair water quality that partially supports designated uses because of turbidity, siltation, salinity, and metals loading from rangeland, agriculture, irrigation return flows, and upstream mining. Information was not available for assessing effects of toxic contaminants and acid rain. There is no information about water quality conditions in wetlands.

Ground Water Quality

Community ground water quality generally complies with EPA's Maximum Contaminant Levels, but concentrations of total dissolved solids often exceed recommended concentrations. However, members of the Community have either adjusted to the aesthetic problem of high dissolved solids or begun purchasing bottled water, as have other ground water users in the metropolitan Phoenix area. Occasionally, concentrations of coliform bacteria, nitrates, and fluoride exceed recommended criteria in isolated wells. Pathogens from onsite sewage disposal systems have been detected in ground water and pose the primary public health concern. Other concerns include salinity and pesticides from large-scale agriculture and potential fuel or solvent leaks.

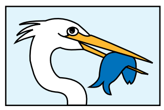
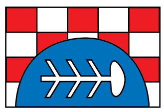
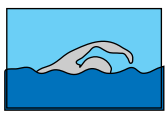
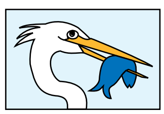
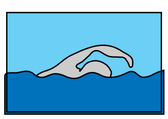
Programs to Restore Water Quality

The Gila River Indian Community needs a comprehensive water quality protection program, especially as nearby urban growth and agricultural expansion create additional pollution and place new demands on aquatic resources. As a first step, the Community's Water Quality Planning Office intends to address point sources of pollution through a Ground Water Protection Strategy. The Strategy will seek to eliminate all discharges that could reach ground water or require rapid mitigation if a discharge cannot be avoided. Principles of Arizona's Aquifer Protection Permit Program may serve as a basis for the Community's Strategy, but the Strategy will be streamlined and simple to implement. The Strategy may include technology-based or standards-based protocols for facilities and conditions for land use permits.

Programs to Assess Water Quality

The Community needs monitoring programs for ground water, surface water, and wetlands in order to assess use support and to support a water pollution control program.

Individual Use Support in Gila River Indian Community

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Poor (Not Attainable)
Rivers and Streams (Total Miles = 196)[b]						
	Total Miles Assessed 196	0	0	31	69	0
	–	–	–	–	–	–
	196	0	0	31	69	0
Lakes (Total Acres = 153)						
	Total Acres Assessed 153	0	0	18	82	0
	153	0	0	0	100	0
	153	0	0	18	82	0

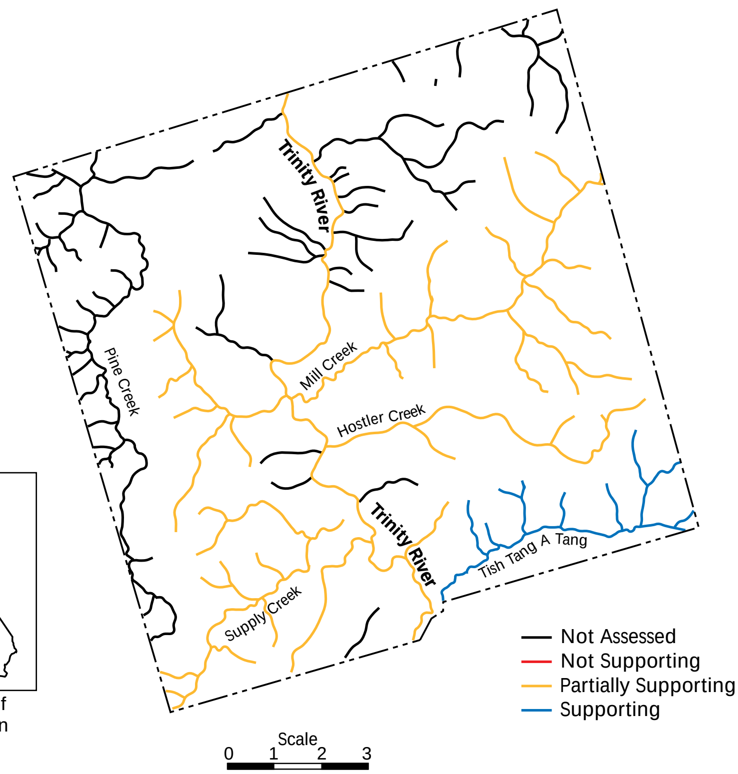
- Not reported.

[a] A subset of Gila River Indian Community's designated uses appear in this figure. Refer to the Community's 305(b) report for a full description of the Community's uses.

[b] Includes nonperennial streams that dry up and do not flow all year.

Hoopa Valley Indian Reservation

Location of Reservation



For a copy of the Hoopa Valley Indian Reservation 1994 305(b) report, contact:

Colleen Goff
P.O. Box 1314
Hoopa, CA 95546
(916) 625-4275

Surface Water Quality

The Hoopa Valley Indian Reservation covers almost 139 square miles in Humboldt County in northern California. The Reservation contains 133 miles of rivers and streams, including a section of the Trinity River, and 3,200 acres of wetlands. The Reservation does not contain any lakes.

Surface waters on the Reservation appear to be free of toxic organic chemicals, but poor forest management practices and mining operations, both on and off the Reservation, have caused significant siltation that has destroyed gravel spawning beds. Water diversions, including the damming of the Trinity River above the Reservation, have also stressed the fishery by lowering stream volume and flow velocity. Low flows raise water temperatures and reduce flushing of accumulated silt in the gravel beds. Upstream dams also stop gravel from moving downstream to replace excavated gravel. Elevated fecal coliform concentrations also impair drinking water use on the Reservation.

Ground Water Quality

Ground water sampling revealed elevated concentrations of lead, cadmium, manganese, iron, and fecal coliforms in some wells. The Tribe is concerned about potential contamination of ground water from leaking underground storage tanks, septic system leachfields, and abandoned hazardous waste sites with documented soil contamination. These sites contain dioxins, herbicides, nitrates, PCBs, metals, and other toxic organic chemicals. The Tribe's environmental consultants are designing a ground water sampling program to monitor potential threats to ground water.

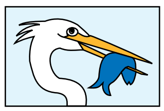
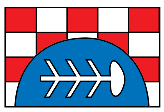
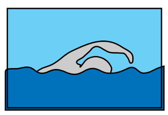
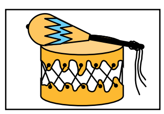
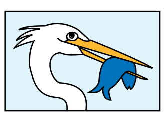
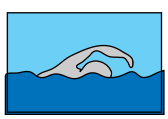
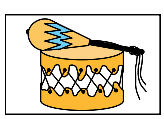
Programs to Restore Water Quality

In 1990, EPA approved the Hoopa Valley Tribe's application for treatment as a State under the Section 106 Water Pollution Control Program of the Clean Water Act. Following approval, the Tribe received Section 106 funding to conduct a Water Quality Planning and Management Program on the Reservation. The Tribal Water Quality Manager is developing water quality criteria for the Reservation, with the help of environmental consultants. The proposed criteria will be reviewed by the Hoopa Valley Planning Department and the Tribal Council.

Programs to Assess Water Quality

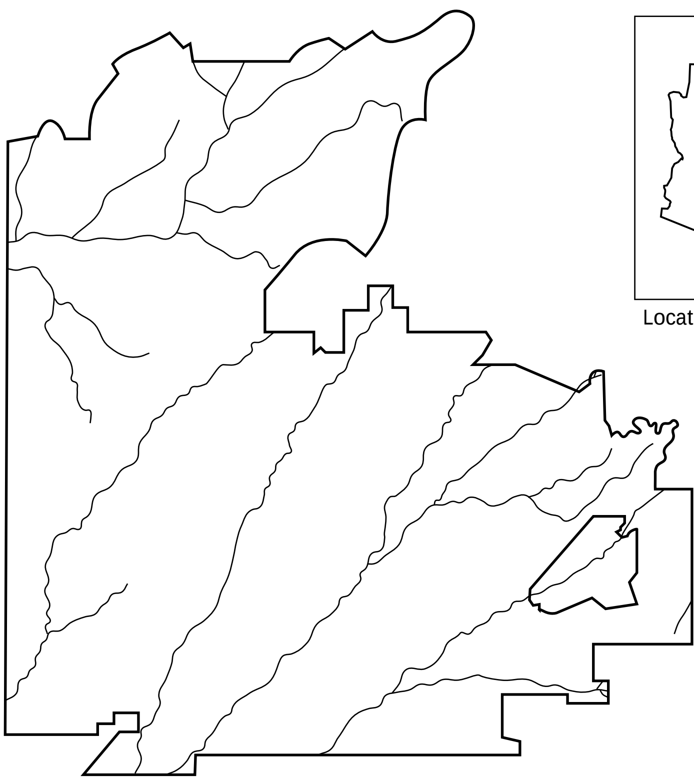
In June of 1992, the Tribal Planning Office and its hired consultants sampled eight surface water sites and six ground water sites. The Tribe measured different pollutants at each site, depending on the surrounding land use activities, including conventional pollutants, toxic organic pollutants, metals, and fecal coliforms. The Tribe plans to establish fixed monitoring sites in the near future, which will complement ongoing biological monitoring conducted by the Hoopa Valley Fisheries Department on the Trinity River.

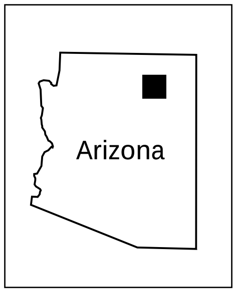
Individual Use Support in Hoopa Valley Indian Reservation

Designated Use[a]		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Poor (Not Attainable)
Rivers and Streams (Total Miles = 133)[b]	Total Miles Assessed					
	77	0	12	88	0	0
	77	100	0	0	0	0
	77	100	0	0	0	0
	77	12	67	21	0	0
Wetlands (Total Acres = 3,200)	Total Acres Assessed					
	3,200	0	0	100	0	0
	–	–	–	–	–	–
	–	–	–	–	–	–
	3,200	0	0	100	0	0

- Not reported.
[a] A subset of Hoopa Valley Indian 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.

Hopi Tribe





Location of Hopi Tribe

For a copy of the Hopi Tribe's 1994 305(b) report, contact:

Phillip Tuwaletstiwa
The Hopi Tribe
Water Resources Program
Box 123
Kykotsmobi, AZ 86039
(520) 734-9307

Surface Water Quality

The 2,439-square-mile Hopi Reservation, located in northeastern Arizona, is bounded on all sides by the Navajo Reservation. Surface water on the Hopi Reservation consists primarily of intermittent or ephemeral streams. Only limited data regarding stream quality are available. The limited data indicate that some stream reaches may be deficient in oxygen, although this conclusion has not been verified by repeat monitoring.

In addition to the intermittent and ephemeral washes and streams, surface water on the Hopi Reservation occurs as springs where ground water discharges as seeps along washes or through fractures and joints within sandstone formations. The Hopi Tribe assessed 18 springs in 1992 and 1993. The assessment revealed that several springs had one or more exceedances of nitrate, selenium, total coliform, or fecal coliform. The primary potential sources of surface water contamination on the Hopi Reservation include mining activities outside of the Reservation, livestock grazing, domestic refuse, and wastewater lagoons.

Ground Water Quality

In general, ground water quality on the Hopi Reservation is good. Ground water from the N-aquifer provides drinking water of excellent quality to most of the Hopi villages. The D-aquifer, sandstones of the Mesaverde Group, and alluvium also provide ground water to shallow stock and domestic wells, but the quality of the water from these sources is generally of poorer quality than the water supplied by the N-aquifer.

Mining activities outside of the Reservation are the most significant threat to the N-aquifer. Extensive pumping at the Peabody Coal Company Black Mesa mine may induce leakage of poorer quality D-aquifer water into the N-aquifer. This potential problem is being investigated under an ongoing monitoring program conducted by the U.S. Geological Survey. In addition, the U.S. Department of Energy is investigating ground water impacts from abandoned uranium tailings at Tuba City. Other potential sources of contamination in shallow wells include domestic refuse, underground storage tanks, livestock grazing, wastewater lagoons, and septic tanks.

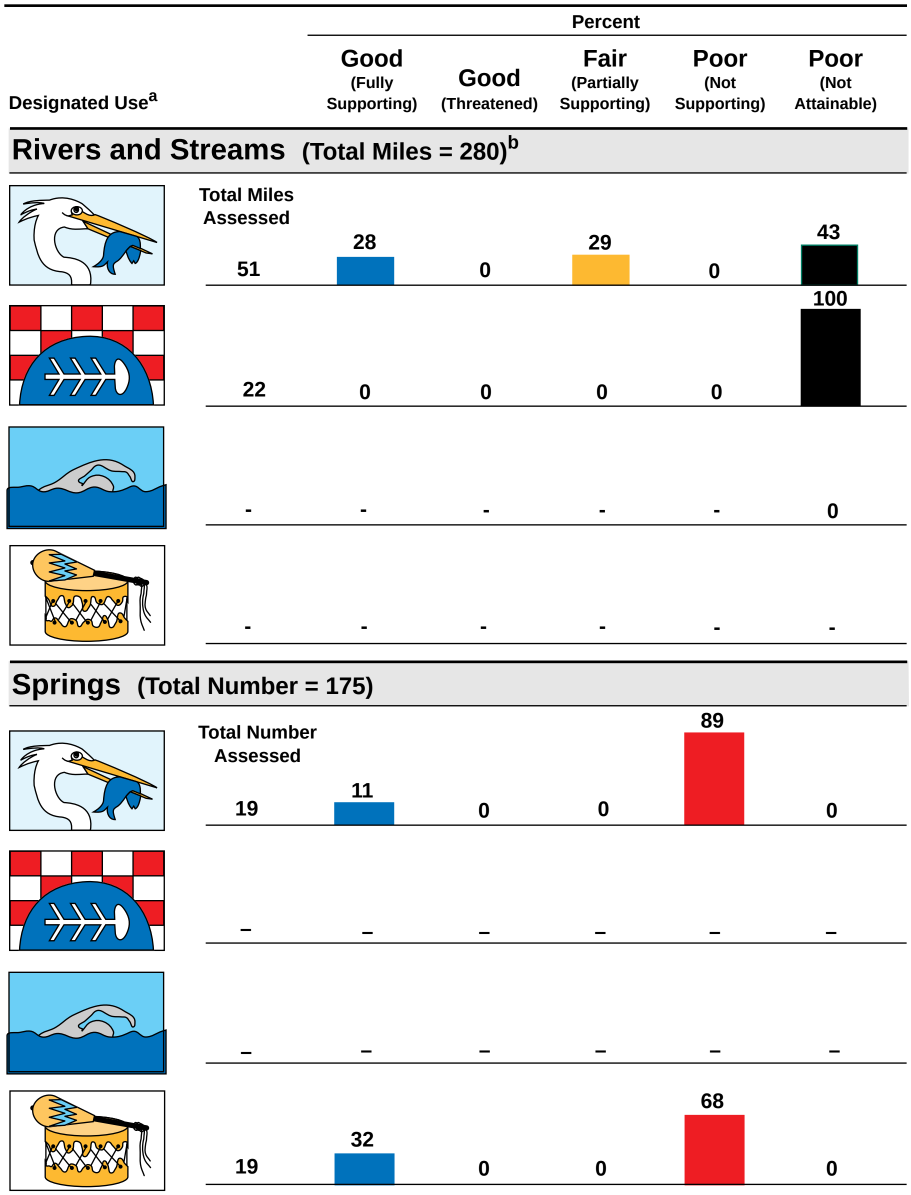
Programs to Restore Water Quality

Draft water quality standards (including an antidegradation policy) were prepared for the Tribe in 1993. The Tribe is also reviewing a proposed general maintenance program to control sewage lagoons. The Tribe has repeatedly applied for EPA grants to investigate nonpoint source pollution on the Reservation, but the applications were denied.

Programs to Assess Water Quality

The Tribe focused on monitoring springs and ground water during the 1994 reporting cycle. Future surface water monitoring will assess aquatic life in springs, lakes, and streams; baseflow and storm flow in streams; and biological, sediment, and chemical content of streams and springs.

Individual Use Support in Hopi Reservation

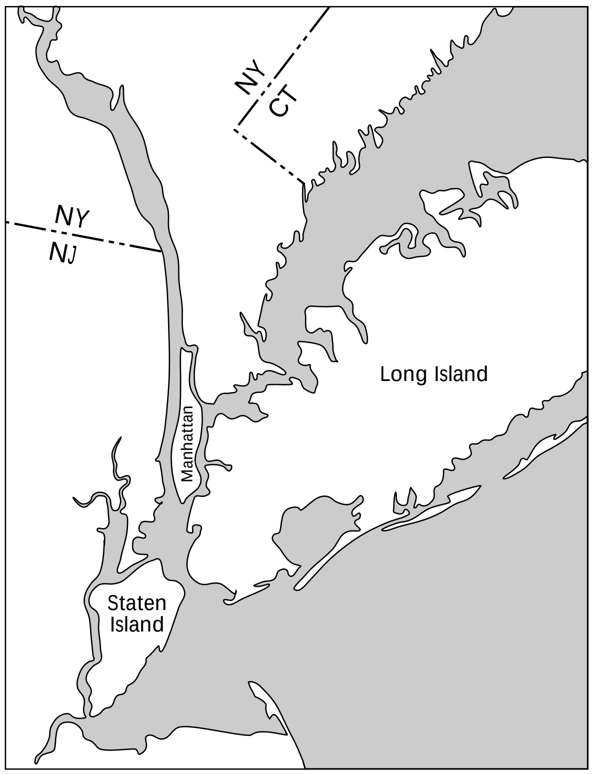


- Not reported.

[a] A subset of the Hopi Tribe'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.

Interstate Sanitation Commission



Basin Boundaries
(USGS 6-Digit Hydrologic Unit)

For a copy of the Interstate Sanitation Commission 1994 305(b) report, contact:

Howard Golub
Interstate Sanitation Commission
311 West 43rd Street
New York, NY 10036
(212) 582-0380

Surface Water Quality

Established in 1936 by Federal mandate, the Interstate Sanitation Commission (ISC) is a tristate environmental agency of the States of New Jersey, New York, 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, Lower Hudson River, Newark Bay, Raritan Bay, Sandy Hook Bay, and Upper New York Bay.

In general, water quality in the District waters improved during the 1992-1993 reporting cycle. Dissolved oxygen concentrations increased and bacteria densities decreased. The reduction in bacteria is due to the Commission's year-round disinfection regulations (which took effect in 1986), and the elimination of discharges receiving only primary treatment at Middlesex and Hudson Counties.

Topics of concern to the ISC include compliance with ISC regulations, toxic contamination in District waters, pollution from combined sewer overflows, closed shellfish waters, and wastewater treatment capacity to handle growing flows from major building projects.

Ground Water Quality

The ISC's primary focus is on surface waters shared by the States of New Jersey, New York, and Connecticut.

Programs to Restore Water Quality

The ISC actively participates in the Long Island Sound Study, the New York-New Jersey Harbor Estuary Program (HEP), the New York Bight Restoration Plan, and the Dredged Material Management Plan for the Port of New York and New Jersey. The ISC has representatives on the Management

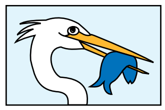
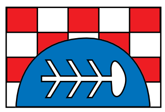
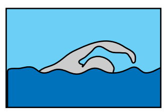
Committees and various workgroups for each program. For the HEP, the ISC organized a meeting entitled "Current Beach Closure Practices in New York, New Jersey, and Connecticut: Review and Recommendations" in November 1993. Representatives of State, county, and municipal health departments and environmental agencies were invited to discuss bathing beach monitoring and closure policies. The public and environmental advocacy groups were also invited. The ISC reported the results to the HEP Pathogens Work Group.

During 1993, the ISC inspected 71 CSO outfalls in an effort to identify and eliminate all dry weather discharges. The ISC notified the States of dry weather discharges detected during field investigations and worked with the States to eliminate dry weather discharges.

Programs to Assess Water Quality

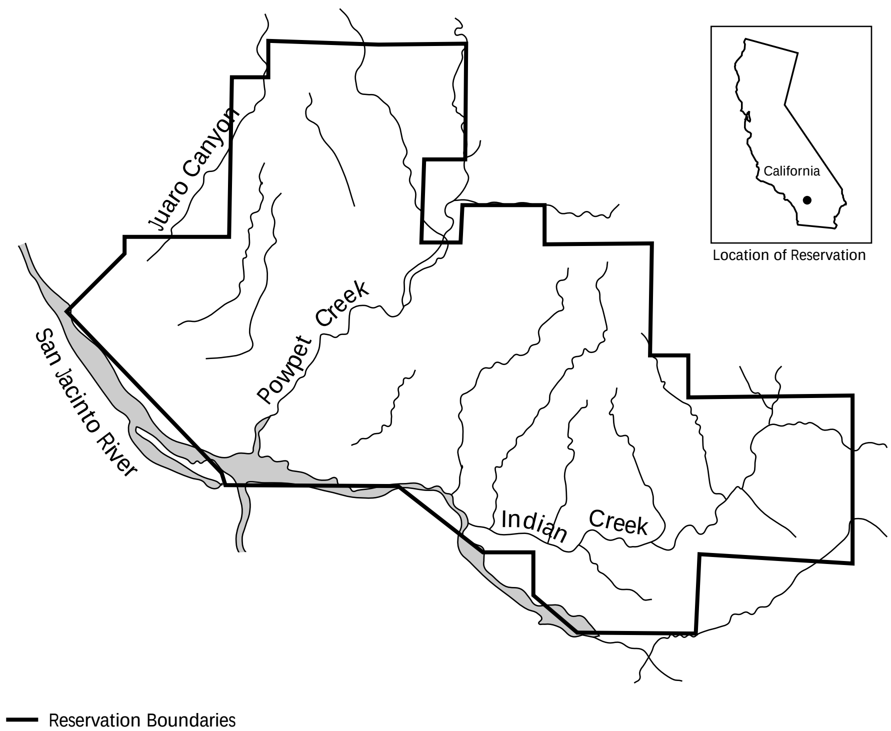
The ISC performs intensive ambient water quality surveys and samples effluent discharged by publicly owned and private wastewater treatment facilities and industrial facilities into District waterways. By agreement, the ISC's effluent requirements are incorporated into the individual discharge permits issued by the participating States.

Individual Use Support in Interstate Sanitation Commission Waters

Designated Use[a]		Percent Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Poor (Not Attainable)
Estuaries (Total Square Miles = 72)						
	Total Miles Assessed -	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

[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.

Soboba Band of Mission Indians



For a copy of the Soboba Band of Mission Indians 1994 305(b) report, contact:

Jamie S. Megee
Soboba Band of Mission Indians
P.O. Box 487
San Jacinto, CA 92581
(909) 654-2765

Surface Water Quality

The Soboba Reservation encompasses about 9.2 square miles in southern California about 80 miles east of Los Angeles. The San Jacinto River is the major surface water feature on the Reservation. At one time, the San Jacinto River flowed year-round, but upstream diversions and ground water withdrawals outside of the Reservation have reduced the flow to intermittent status for many years.

The chemical quality of surface water on the Soboba Reservation is excellent and remains unimpaired to date, based on very limited data. The quality of surface water, to the extent it is available, fully supports the existing uses of ground water recharge, wildlife habitat, and recreation. Overall, the greatest threat to water quality on the Soboba Reservation is the reduction of surface flows and ground water storage by off-Reservation diversions and pumping.

Ground Water Quality

Three major water supply wells extract water from two aquifers on the Soboba Reservation. Ground water overdraft outside the Reservation has seriously reduced the withdrawal capacity of the Reservation's wells and aquifers. The chemical quality of ground water on the Soboba Reservation is excellent and remains unimpaired to date. The single most critical threat to water quality is a proposal by the Eastern Municipal Water District to routinely recharge treated effluent at a site within 600 feet of an existing Soboba well.

Programs to Restore Water Quality

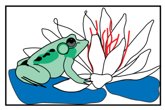
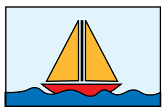
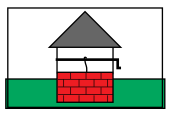
There are no formal water pollution control programs in place on the Reservation. However, the Band has achieved compliance with EPA monitoring and treatment requirements for its domestic ground water supply system and the Band is considering development of a wellhead protection program. In addition, the Band is seeking assistance from EPA under the Indian Environmental General Assistance Program to educate the Band about water quality issues, establish water resource protection ordinances, and undertake other water protection initiatives.

The Soboba Band is continuing its struggle to assert and defend its water rights. The Soboba Band has started negotiating with the major water users outside of the Reservation to fairly apportion the waters of the basin. Nondegradation of water quality will be a basic element of the Band's position in these negotiations.

Programs to Assess Water Quality

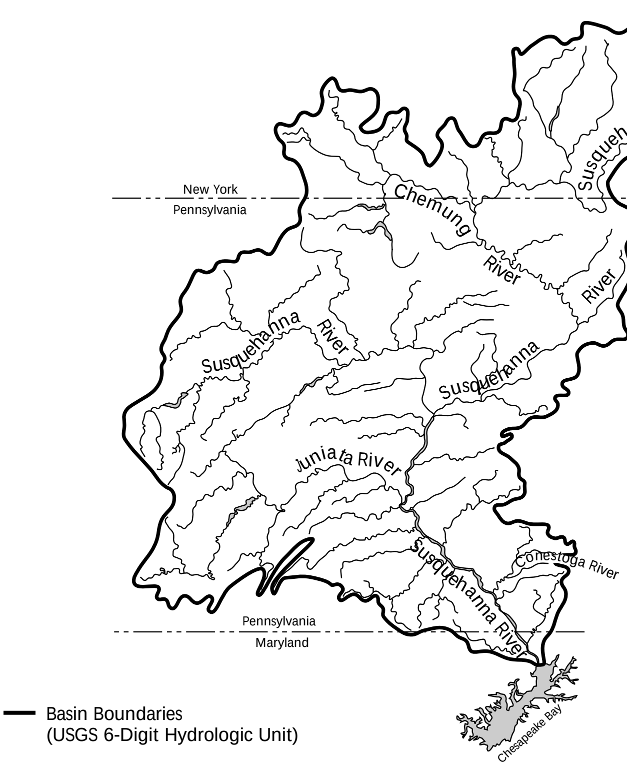
The Band advocates sharing and cooperative analysis of data on the hydrology and water quality of the San Jacinto watershed to facilitate water rights negotiations. This affirmative approach to water resource management should lead to a systematic, integrated water quality monitoring program for the basin that will benefit all users.

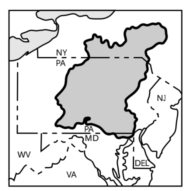
Individual Use Support in Soboba Band of Mission Indians

Designated Use[a]	Total Miles Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Poor (Not Attainable)
Rivers and Streams (Total Miles = 7.4)[b]						
	2.9	100	0	0	0	0
	2.9	100	0	0	0	0
	7.4	100	0	0	0	0

[a] A subset of Soboba Band of Mission Indians' designated uses appear in this figure. Refer to the Band's 305(b) report for a full description of the Band's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.

Susquehanna River Basin Commission





Location of Commission Jurisdiction

For a copy of the Susquehanna River Basin Commission 1994 305(b) report, contact:

Robert E. Edwards
Susquehanna River Basin Commission
Resource Quality Management and Protection
1721 North Front Street
Harrisburg, PA 17102-0423
(717) 238-0423

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 fresh water entering the Chesapeake Bay. The Susquehanna River Basin Commission (SRBC) surveyed 17,464 miles of the 31,193 miles of rivers and streams in the Susquehanna River Basin. Over 90% of the surveyed river miles fully support designated uses, 4% partially support uses, and 6% do not support one or more designated uses. Metals, low pH, and nutrients are the primary causes of stream impacts in the Basin. Coal mine drainage is the source of most of the metals and pH problems degrading streams. Sources of nutrients include municipal and domestic wastewater discharges, agricultural runoff, and ground water inflow from agricultural areas.

During past reporting cycles, SRBC did not conduct any lake or reservoir assessments. However, a 2-year project funded by EPA and Pennsylvania should provide a foundation of lake data upon which SRBC can launch its lake assessment program.

Ground Water Quality

Ground water in the Basin is generally of adequate quality for most uses. Many of the ground water quality problems in the Basin are related to naturally dissolved constituents (such as iron, sulfate, and dissolved solids) from the geologic unit from which the water originates. The SRBC is concerned about ground water contamination from septic systems and agricultural activities.

Programs to Restore Water Quality

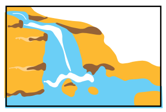
The Susquehanna River Basin Compact assigns primary responsibility for water quality management and control to the signatory States. The SRBC's role is to provide a regional perspective for coordinating local, State, and Federal water quality management efforts. For example, the SRBC reviews proposed discharge permits (issued by the States) and evaluates potential interstate and regional impacts. The SRBC also recommends modifications to State water quality standards to improve consistency among the States.

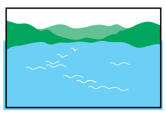
Programs to Assess Water Quality

The SRBC's role in interstate and regional issues shaped the Commission's monitoring program. The SRBC's fixed-station monitoring network collects base flow data and seasonal-storm nutrient data on the Susquehanna mainstem and major tributaries to assist the Chesapeake Bay Program in evaluating nutrient reduction projects. The SRBC also established an interstate stream water quality network to evaluate streams crossing State boundaries for compliance with State water quality standards. Biological monitoring is conducted annually at 29 sites. The SRBC also conducts intensive subregional surveys to analyze regional water quality and biological conditions.

Overall[a] Use Support in the Susquehanna River Basin

		Percent				
		Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Poor (Not Attainable)
Rivers and Streams (Total Miles = 31,193)[b]	Total Miles Assessed: 17,464	90	-	4	6	-
Lakes (Total Acres = 79,687)	Total Acres Assessed: -	-	-	-	-	-





- Not reported.
[a] Overall use support is presented in this figure because the Commission did not report individual use support in their 1994 Section 305(b) report.
[b] Includes nonperennial streams that dry up and do not flow all year.

Section II

Basinwide Survey:
Ohio and Tennessee River Valley

Basinwide Survey: Ohio and Tennessee River Valley

Introduction

The U.S. Environmental Protection Agency (EPA) requested that the Ohio River Valley Water Sanitation Commission (ORSANCO) and the Tennessee Valley Authority (TVA) produce a prototype basinwide assessment of water quality conditions in the Ohio and Tennessee River Valley. This basinwide assessment illustrates how EPA might present information in the *National Water Quality Inventory Report to Congress* in future years. The information in this assessment was drawn from several sources, primarily the most recent Section 305(b) reports submitted by the individual States in the Ohio and Tennessee River Valley. This assessment illustrates how EPA can compile State water quality information into assessments of conditions in major basins throughout the United States.

The Ohio and Tennessee River basin assessment also illustrates many of the recommendations proposed by the Intergovernmental Task Force on Monitoring Water Quality (ITFM). The ITFM was established to develop a strategic plan for effective collection, interpretation, and presentation of water quality data nationwide and to improve its availability for decision making (see sidebar).

The three major sections in this report are: (1) an overview of conditions throughout the entire Ohio and Tennessee River basin; (2) a more detailed analysis of water quality conditions in the Allegheny River subbasin; and (3) a discussion of special concerns and recommendations. The basin overview describes how well watersheds throughout the basin support four basic stream uses—aquatic life support, contact recreation (such as swimming), public drinking water supply, and fish consumption. The overview also identifies pollutants impairing the use of streams and the sources of these pollutants. The section on the Allegheny River Watershed illustrates the level of detail that can be presented for smaller individual watersheds within a large basin. Finally, this report describes special issues of concern in the Ohio and Tennessee River basin and recommends changes to monitoring and reporting methods that should make it easier to integrate water quality information submitted by multiple agencies into an interstate basinwide water quality assessment.

ORSANCO

Basin Description

The Ohio and Tennessee River basin covers more than 200,000 square miles in 14 States and constitutes 6.5% of the continental United States (Figure 1). The Ohio River mainstem extends 981 miles from Pittsburgh, Pennsylvania, to Cairo, Illinois, where it joins the Mississippi River. Along the way, the Ohio River forms the border between Ohio, Indiana, and Illinois to the north and West Virginia and Kentucky to the south.

The basin's topography varies from the Appalachian Mountains in the east to the midwestern prairies in the west. Land use patterns generally follow topographic characteristics. Forests, agriculture, and mining dominate the land use in the northeastern portion of the basin; most of the land is forested in the southeastern portion; and

About This Section

Communicating information about environmental conditions to the public is a challenging task for scientists and engineers. They are trained to focus on details and use precise technical terms so others can repeat their experiments and analyses. As a result, most scientific papers are nearly incomprehensible to anyone except narrowly focused specialists. But the public and elected officials are interested in environmental conditions. Furthermore, the public ultimately pays for most environmental research and monitoring, either through taxes or by purchasing consumer goods with those costs embedded in the prices.

Recognizing these facts, in 1992 the Intergovernmental Task Force on Monitoring (ITFM), a multiagency group examining ways to improve water quality monitoring throughout the United States, began identifying common characteristics of successful environmental reports. They found reports that effectively communicate environmental information to the public use common guidelines taught in journalism:

- Put the most important information at the beginning.
- Draw significant conclusions without too many qualifications.
- Write in a conversational style that is easy to read.
- Avoid technical terms as much as possible and keep sentences relatively short.
- When technical terms must be used, define them directly or through context.
- Use clear and accurate graphics that help illustrate the ideas presented in the text.
- Avoid complex figures that try to convey too much information.
- If possible, use color to increase appeal to readers, to make figures easier to understand, and to tie common elements together throughout the report.
- Be brief—know how long a report your audience is likely to actually read.
- Have enough “white space” to make text pages less intimidating to readers.
- Use a multicolumn format, which helps make text pages more “friendly.”
- Use a serif typeface for text and a san-serif typeface for headings.

Most audiences are interested in reports that integrate environmental information across scientific disciplines and political boundaries. They may want to pull the information apart to get a State-by-State picture or to see results for one scientific discipline such as fisheries. However, they first want to see how the different pieces fit together to form a complete picture of environmental conditions.

agricultural cropland dominates the western areas of the basin. Almost three-fourths of the Nation’s identified coal reserves are located within the basin. Due in part to this fact, there are a considerable number of electric power plants located in the basin. Other major industries include steel and petrochemical production.

Over 26 million people live in the Ohio and Tennessee River basin. Large cities include Pittsburgh, Cincinnati, and Louisville on the Ohio River mainstem, as well as Columbus, Indianapolis, Chattanooga, and Nashville. Major tributaries to the Ohio River include the Allegheny, Monongahela, Kanawha, Kentucky, Green, Wabash, Cumberland, and Tennessee Rivers.

Water Use in the Basin

Abundant rainfall in the Ohio and Tennessee River Valley maintains steady flows in the Ohio River and its tributaries that support many uses, such as transportation, drinking water supply, and industrial uses. Over 40% of the Nation’s waterborne commerce is transported on more than 2,500 miles of commercially navigable waterways in the Ohio and Tennessee River basin. Coal and petroleum products are the most common commodities carried by barge on the navigable waterways. Streams and lakes in the basin also provide water for a variety of industrial purposes, including processing and cooling. Numerous coal-fired power plants and nuclear facilities use large amounts of water to cool

Figure 1. Ohio and Tennessee River Basin

steam produced by these plants. There are also a number of hydroelectric power plants in the basin, particularly on the Tennessee and Cumberland Rivers.

Water uses of primary concern in this assessment are those that depend on good water quality conditions (e.g., public water supply, water contact recreation, aquatic life use, and fish consumption). Most of the rivers, streams, and lakes in the basin are classified for more than one of these uses.

About 10 million people in the basin receive drinking water from public water supply systems that use surface water as a source. Most of the designated swimming beaches are located on the many lakes and reservoirs in the basin, but many people also water ski on and swim in the larger rivers. Whitewater canoeing, kayaking, and rafting are popular activities on several rivers, including the New and the Gauley in West Virginia, the Ocoee in Tennessee, and the Nantahala in North Carolina.

Most of the waters of the basin are capable of supporting warm water aquatic communities that include bass, catfish, sauger, and sunfish. Sport fishing is steadily increasing throughout the basin, and there is a significant commercial fishing and mussel industry on the Tennessee and lower Ohio Rivers.

Rating Water Quality Conditions in the Basin

EPA and the States rate water quality conditions by comparing water quality data and narrative information with water quality criteria established by the States. Water quality criteria define conditions that must be met to support designated beneficial uses (such as bacteria limits for safe swimming use). Each State is responsible for assigning (i.e., designating) uses to each of the waterbodies within its borders. A State may designate a waterbody for multiple uses, and each designated use may have different criteria. At a minimum, the Clean Water Act requires that States designate their waters for uses that protect swimming and aquatic life.

EPA encourages the States to use consistent use support categories for rating water quality conditions in their waterbodies:

- Fully supporting – good water quality meets criteria for designated uses.

- Threatened – good water quality meets designated use criteria now, but may not in the future.

- Partially supporting – fair water quality fails to meet designated use criteria at times.

- Not supporting – poor water quality frequently fails to meet designated use criteria.

The States survey use support status in their waterbodies and submit the results to EPA in their Section 305(b) reports every 2 years. ORSANCO and TVA assessed basinwide water quality conditions by pooling the use support information submitted by the Ohio and Tennessee River basin States in their most recent Section 305(b) reports (most of which were submitted in 1994). ORSANCO and TVA focused on four basic designated uses—aquatic life support, contact recreation (such as swimming), public water supply, and fish consumption. These uses were selected because they are more sensitive to water quality conditions than other uses (such as transportation), and the States have designated most of the rivers, streams, and lakes in the basin for one or more of these uses.

In addition, ORSANCO and TVA compiled assessment information concerning water quality conditions in individual watersheds within the Ohio and Tennessee River basin. Where possible, ORSANCO and TVA organized the States' use support information by watersheds defined by the U.S. Geological Survey (USGS). USGS divides the United States (including the Ohio and Tennessee River basin) into many watersheds, each identified with a unique 8-digit hydrologic unit code (HUC). Each watershed unit consists of a set of connected rivers, lakes, and other waterbodies that drain about 1,000 square miles. A few States did not report their 305(b) information by standardized 8-digit HUCs, so ORSANCO and TVA summarized their data by larger watershed units when possible. In some cases, data had to be excluded from the watershed assessments for those States that did not associate their water quality information with any watershed units.

Each watershed contains multiple rivers and streams, some of which are typically in excellent condition while others are in fair or poor condition. For this report, ORSANCO and TVA developed five categories for rating general water quality conditions in watersheds based on the combination of river miles in good, fair, or poor condition (i.e., fully supporting uses or threatened, partially supporting uses, or not supporting uses). Watersheds with a high percentage of river miles fully supporting designated uses received the best water quality rating. The worst water quality rating was assigned to watersheds with a high percentage of river miles not supporting designated uses. The remaining watersheds received three intermediate water quality ratings. The criteria for each rating category were derived by ranking conditions in streams and assigning an equal number of assessed stream miles to each category.

This approach to rating water quality conditions provides a good picture of relative conditions among watersheds. It should be applicable for evaluating conditions in other large river basins; however, rating categories for other basins will not necessarily correspond to those used for the Ohio and Tennessee River basin. Redefinition of rating categories may be necessary.

Overview of Conditions in the Ohio and Tennessee River Basin

Aquatic Life Use Support

Basinwide Assessment

During 1992-1994, the States surveyed aquatic life use support status in approximately one-third (33%) of all rivers and streams within the Ohio and Tennessee River basin (Figure 2), or almost half (45%) of the perennial rivers and streams (those that flow year round) in the basin. The States assessed aquatic life use support in more river miles than any other designated use. Eleven of the 14 States within the basin presented aquatic life use information in their 1994 Section 305(b) reports in a format that enabled ORSANCO and TVA to isolate the data pertaining to the Ohio and Tennessee River basin from statewide

Figure 2. River Miles Surveyed

Total rivers = 255,330 miles
Total surveyed = 83,366 miles

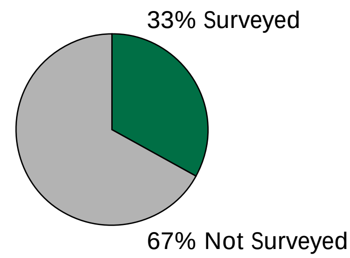
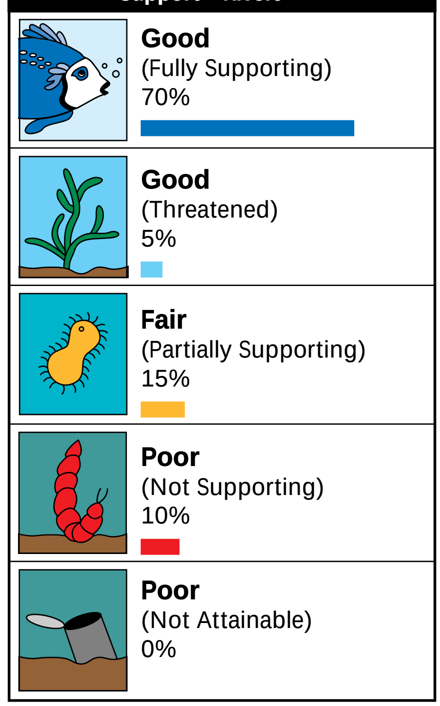


Figure 3. Levels of Overall Use Support – Rivers



Source: Based on 1994 State Section 305(b) reports.

What is Aquatic Life Use?

Waters that fully support aquatic life use provide suitable habitat for the protection and propagation of a healthy community of fish, shellfish, and other aquatic organisms. In general, healthy aquatic communities support many different species of organisms, many of which are intolerant to pollution. Each State establishes its own criteria for measuring how well its waters support aquatic life uses. Some States have biological criteria that directly measure the health of the aquatic community (such as species diversity measurements). However, many States still rely primarily on physical and chemical criteria that define habitat requirements for a healthy aquatic community (such as minimum dissolved oxygen concentrations and maximum concentrations of toxic chemicals). Physical and chemical measurements provide an indirect measure of aquatic community health.

assessment data. Additional information was retrieved from West Virginia's 1992 Waterbody System database.

Approximately 70% of the surveyed streams in the Ohio and Tennessee River basin fully support aquatic life (Figure 3). These rivers and streams provide suitable conditions for the survival and reproduction of fish and other aquatic organisms. An additional 5% of the surveyed streams were classified as threatened because these streams fully support aquatic life uses now, but sources of pollution may jeopardize that support if they are not adequately controlled. Only 15% of the surveyed streams partially support aquatic life, and 10% do not meet State criteria for supporting aquatic life uses.

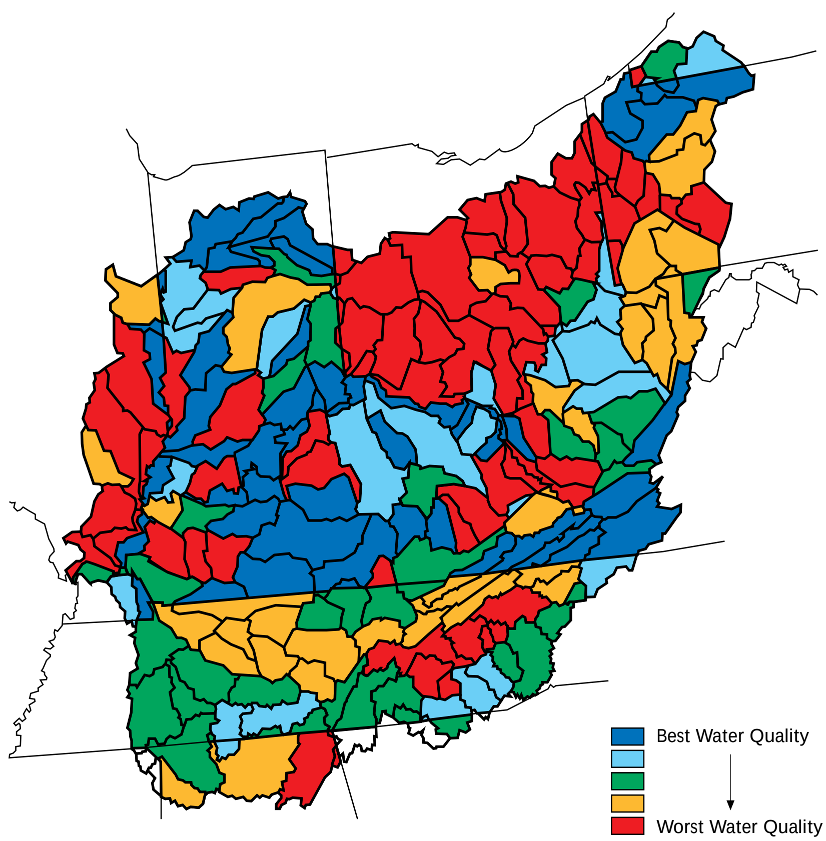
NOTE: For this report, ORSANCO, TVA, and EPA assumed that overall use support information in the Section 305(b) reports and the Waterbody System represents aquatic life use support information. Overall use support is a combined measure of how well a waterbody supports all of its individual uses. Overall use is impaired if poor water quality conditions impair one or more individual uses. For many waterbodies, aquatic life use support status equates with the overall use support rating because aquatic life use is more sensitive to pollution than other designated uses.

Watershed Assessments

Figure 4 illustrates aquatic life use support ratings for individual watersheds in the Ohio and Tennessee River basin. The ratings range from the best use support status (blue) to the worst use support status (red), with three intermediate ratings (light blue, green, and gold). The use support ratings summarize general conditions in each watershed. The best watersheds contain the highest percentage of rivers and streams that fully support aquatic life use, even though these watersheds may contain a few streams that do not support aquatic life. However, when examined as a group, more rivers and streams in the best watersheds support aquatic life uses. Watersheds that appear red contain the greatest percentage of streams not supporting aquatic life use, although several streams in these watersheds may fully support a diverse aquatic community.

Figure 4 suggests that Ohio contains many of the watersheds with the worst aquatic life use support status, but it is very unlikely that water quality conditions in

Figure 4. Aquatic Life Use Support: Ohio and Tennessee River Basin



Ohio are much different than in the adjacent States. It is more likely that Ohio contains a lot of watersheds with poor ratings because Ohio uses primarily biological monitoring data and strict criteria to assess aquatic life use support status in its rivers and streams. Ohio Environmental Protection Agency studies show that using biological data to evaluate aquatic life use support identifies 35% to 50% more rivers and streams that do not support aquatic life use than assessments that rely exclusively on chemical and physical data. Consequently, aquatic life use support ratings depend not only on the health of biological communities and the water quality of the rivers and streams, but also on the use support criteria and assessment techniques used by each State.

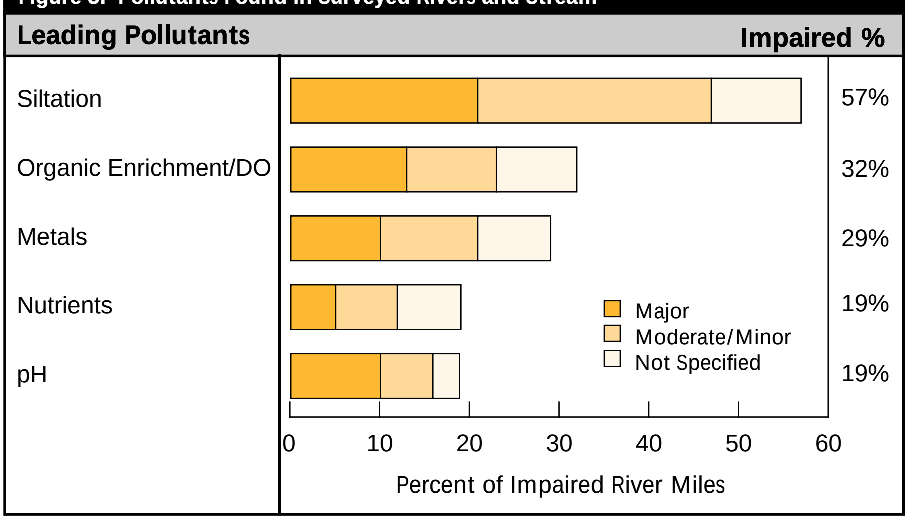
Another example of how differences in State assessment methods affect the use support assessments can be seen along the Kentucky-Tennessee border. Here, the aquatic life use attainment in the Kentucky portion of the Cumberland River watershed is designated as "best," while the Tennessee portion of the watershed is shown as having lower degrees of aquatic life support. Similar "State line faults" occur throughout the basin, particularly along the borders between Indiana and Illinois and between Virginia and North Carolina.

Pollutants Impairing Rivers and Streams

Eleven States reported both aquatic life use assessments and estimates of river miles impaired by specific pollutants.* These States reported that siltation and organic enrichment are the most common pollutants impacting aquatic life throughout the Ohio and Tennessee River basin (Figure 5). Siltation impairs over half of the river miles that fail to fully support aquatic life use. Silt and sediments deposited in rivers and streams destroy the habitat of many aquatic organisms, including nesting and spawning areas of important fish species. Silt also smothers benthic organisms,

NOTE: The sum of river miles impaired by all pollutants may exceed the estimate of river miles that do not fully support designated uses because multiple pollutants may impact an individual river segment. For example, both siltation and nutrients may pollute a 1-mile river reach. In such cases, a State may report that 1 mile is not fully supporting its designated uses, 1 mile is impaired by siltation, and 1 mile is impaired by nutrients. In this example, only 1 stream mile is impaired, but the State identifies pollutants impairing a total of 2 stream miles.

Figure 5. Pollutants Found in Surveyed Rivers and Stream



* This report attempts to discriminate among pollutants impairing aquatic life uses and pollutants impairing other designated uses, such as contact recreation and drinking water supply. However, many States reported total miles of pollutants rather than miles of pollutants for individual uses. As a result, this report assumes that pollutants that impaired the overall use support of a stream also impacted an equal mileage of streams designated for aquatic life use.

and materials suspended in water interfere with respiration and digestion. In addition, contaminated sediments act as a reservoir for different types of pollutants that may be released into the water column over time.

Organic enrichment impacts 32% of the river miles that fail to fully support aquatic life use in the Ohio and Tennessee River basin. Organic enrichment depletes the dissolved oxygen content in the water column. Many desirable fish and other aquatic species cannot survive or propagate in waters with low oxygen concentrations.

Following siltation and organic enrichment, the most common pollutants of rivers and streams within the Ohio River basin are metals, nutrients, and pH (a measure of acidity). Elevated metals concentrations and acidic conditions, often associated with abandoned mining operations, can be lethal to aquatic communities. Excessive inputs of nutrients can harm aquatic communities by triggering the growth of algae populations (i.e., algae blooms) that destabilize dissolved oxygen concentrations in the water column.

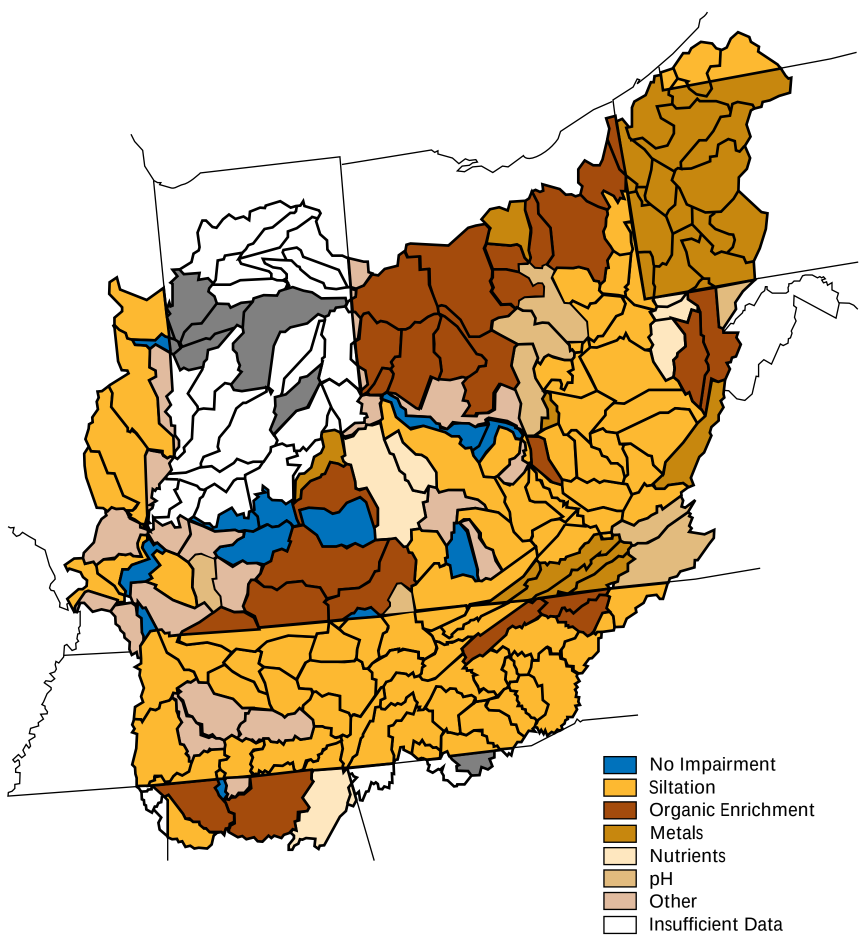
Based on data submitted by 11 States, ORSANCO and TVA identified the most common pollutant in each of the watershed units throughout the basin (Figure 6). Insufficient data were available to determine the major pollutants in Indiana, Georgia, and Mississippi. Figure 6 illustrates that siltation is the most prevalent pollutant in the greatest number of watersheds.

This watershed analysis confirms that siltation is a widespread problem throughout the Ohio and Tennessee River Valley. In contrast, impacts from metals appear to be concentrated in Pennsylvania watersheds and a few isolated watersheds in areas that support mining activities. Impacts from organic enrichment and low dissolved oxygen are most common in Ohio, Kentucky, and the Alabama portion of the Tennessee River subbasin.

Sources of Pollutants Impairing Rivers and Streams

Eleven States also reported the sources of pollutants impairing rivers and streams of the Ohio and Tennessee River basin. The States identified resource extraction, which includes mining and petroleum activities, as the most common source of pollution (Figure 7). Resource extraction accounts for siltation, low pH (i.e., high acidity),

Figure 6. Major Pollutants of Ohio and Tennessee River Basin



and high levels of metals in almost half of all impaired rivers and streams. Some States reported the miles of rivers polluted by specific resource extraction activities, including surface and subsurface mining, acid mine drainage, mine and mill tailings, and petroleum activities (Figure 8). Both active mining and acid mine drainage from active and abandoned mines are significant sources of concern in the Ohio and Tennessee River basin.

Agriculture is the second leading source of pollutants impacting the rivers and streams of the Ohio and Tennessee River basin. Approximately 40% of the impaired rivers and streams do not achieve full aquatic life use support as a result of agricultural activities. Several States reported impacts from more specific agricultural activities, such as nonirrigated crop production and feedlots (Figure 9). Based on more limited data, these States reported that pastureland is the most common agricultural source of impairment in rivers and streams in the Ohio and Tennessee River basin, followed by nonirrigated crop production.

Urban activities also impact many rivers and streams in the basin. Municipal point sources pollute 23% of the impaired river miles in the basin (the third largest source of pollution following resource extraction and agricultural activities). Combined sewer overflows, storm sewers, and urban runoff also impact 18% of the impaired rivers and streams.

ORSANCO and TVA also identified the most common sources of pollutants in each watershed (insufficient data were available to determine the major sources of pollutants in Indiana, Georgia, and Mississippi) (Figure 10). The top three sources of pollution basinwide also generate significant water quality problems within individual watersheds. Resource extraction is by far the most significant pollution source in the upper part of the basin (Pennsylvania, West Virginia, Virginia, and eastern Ohio and Kentucky), while agriculture and municipal point sources predominate in the rest of the basin. Agricultural runoff is a particular concern throughout the Tennessee River basin and the Illinois portion of the Wabash River basin. Waters polluted by municipal point source

Figure 8. Resource Extraction Activities Polluting Rivers and Streams

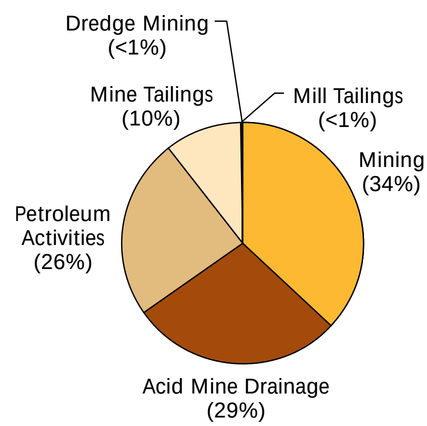


Figure 7. Sources of Pollutants Found in Surveyed Rivers and Streams

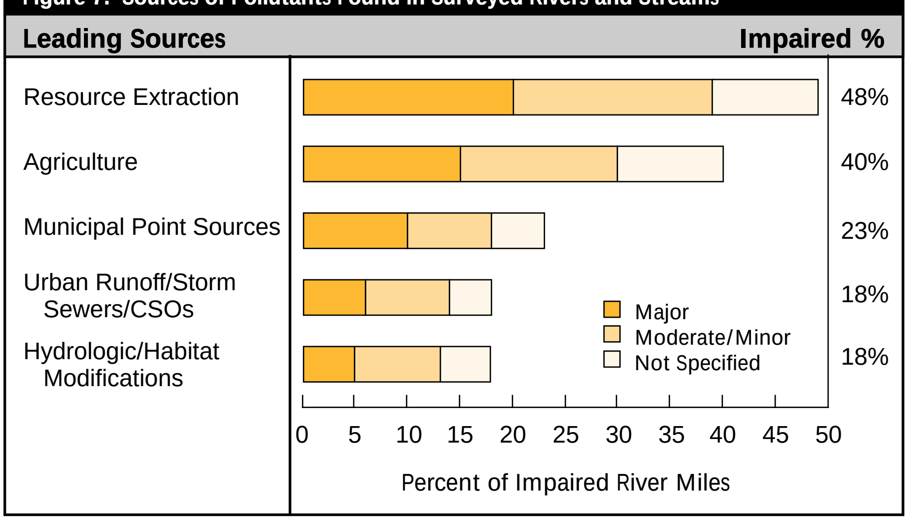
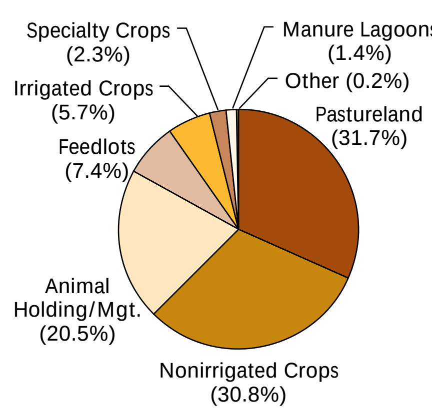


Figure 9. Agricultural Activities Polluting Rivers and Streams



discharges are most common in the Scioto, Little Miami, and Great Miami watersheds within the State of Ohio.

Contact Recreation Use Support

Seven of the 14 States within the Ohio and Tennessee River basin assessed contact recreation use support for rivers and streams in their 1994 Section 305(b) reports. ORSANCO and TVA extracted contact recreation data from another State's 1992 Section 305(b) report, but contact recreation data were not available for the remaining six States. ORSANCO and TVA combined primary contact recreation (i.e., swimming) and secondary contact recreation (activities that involve occasional contact with the water, such as boating) into a single assessment because only one State reported separate information about secondary contact recreation use.

The Ohio and Tennessee River basin States assessed over 44,000 miles of rivers and streams designated for contact recreation use. Almost three-fourths of the streams assessed fully support contact recreation use (Figure 11). In addition, 5% of the stream miles fully support contact recreation use but are threatened.

Only four States and ORSANCO reported the most significant pollutants and sources of pollution preventing their streams from fully supporting water contact recreation. Bacteria are clearly the most significant pollutant impairing contact recreation use in streams and are responsible for 86% of the stream miles impaired for this use. Urban

Figure 10. Major Sources of Pollutants – Ohio and Tennessee River Basin

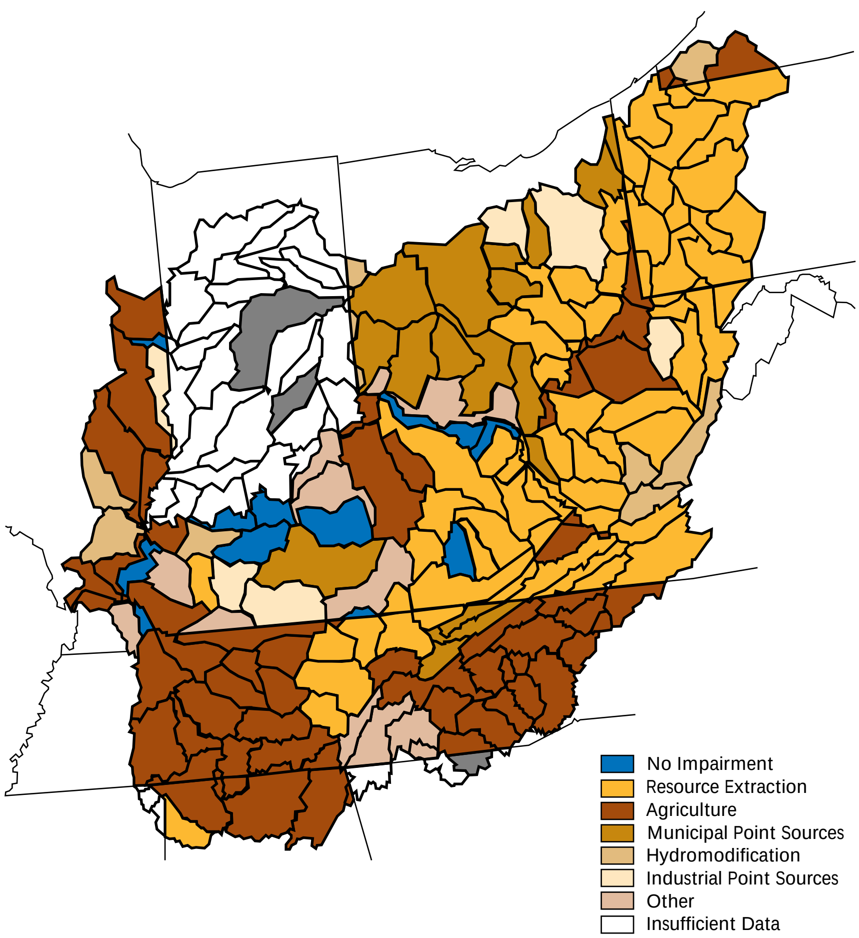
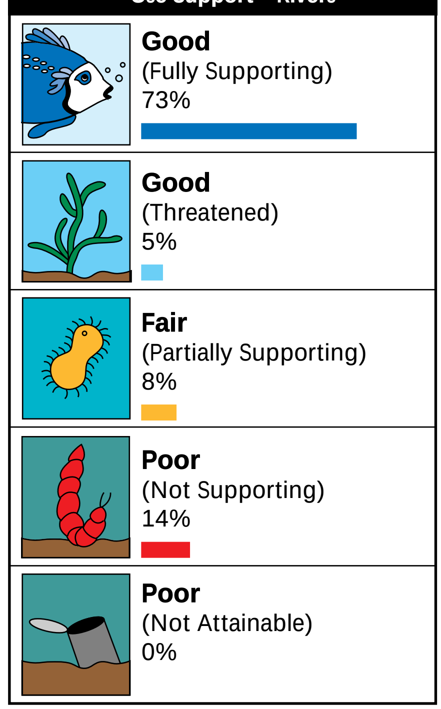


Figure 11. Levels of Primary Contact Recreation (Swimming) Use Support – Rivers



Source: Based on 1994 State Section 305(b) reports.

runoff/storm sewers and combined sewer overflows are the leading sources of pollutants impairing contact recreation use (Figure 12).

Drinking Water Supply Use Support

The States provided minimal information about support of drinking water supply use. Six of the fourteen States in the Ohio and Tennessee River basin assessed drinking water supply use support in just 2% of the river miles in the basin. ORSANCO and TVA acquired data from a 1992 Section 305(b) report for one additional State, but data about drinking water supply use support were not available for the remaining seven States. Due to the limited amount of information available, ORSANCO and TVA could not prepare a basinwide summary of drinking water use status; however, the available data are summarized here.

Nearly three-fourths of the assessed stream reaches fully support drinking water supply use, with an additional 5% classified as fully supporting but threatened (Figure 13). Fifteen percent of the assessed streams partially support drinking water supply use, and 7% do not support the use.

Even less information was available in the States' Section 305(b) reports regarding the pollutants impacting drinking water supply uses or their sources. Only two States and ORSANCO provided pollutant and source information. The minimal data available indicate that pesticides are the most significant pollutants, followed by priority organics, siltation, nutrients, other habitat alterations, and suspended solids. Agricultural runoff was reported as the most common source of pollutants, followed by ground water loadings, channelization, and resource extraction.

Fish Consumption Use Support

Only three States within the Ohio and Tennessee River basin assessed fish consumption use support in their 1994 305(b) reports; however, information about fish consumption advisories was available for each State. States issue advisories to protect the public

Where Are Lakes, Wetlands, and Ground Water?

Except for a short discussion on lakes in the Allegheny River subbasin, this report does not describe water quality conditions in lakes, wetlands, or ground water. The States report less information about these waters because lakes, wetlands, and ground water aquifers present greater water quality monitoring challenges than rivers and streams. Lakes and aquifers have much larger horizontal and vertical water quality variations than do streams. The variation makes it difficult to ensure that samples really reflect conditions throughout the lake or aquifer. Lakes and aquifers also respond to environmental stresses differently than streams and in different time frames. Even when high-quality data are available, there is less agreement on whether they are the right data and on how they should be interpreted.

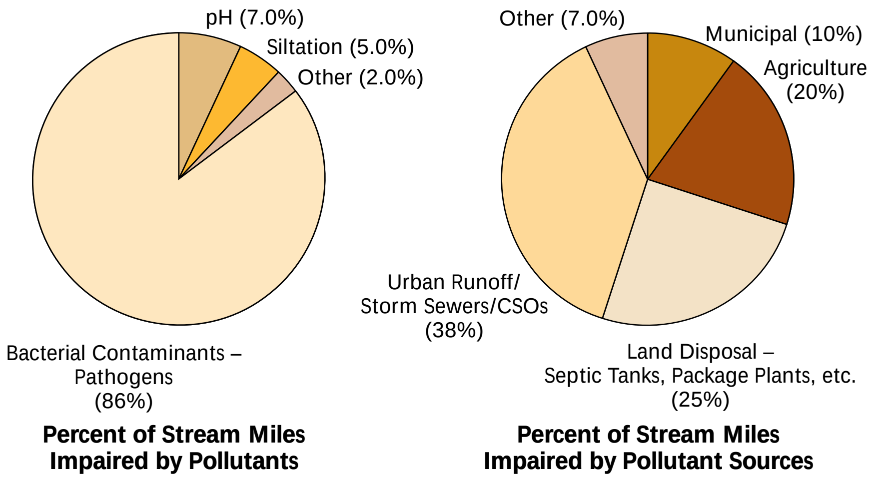
In lakes, factors such as lake shape, lake basin shape, average and maximum depths, flushing rate, and inflow quality profoundly affect conditions for aquatic life. Reservoirs (lakes formed by damming rivers or streams) are even more complicated because they sometimes behave as natural lakes, while at other times or at other locations in the lake, they act more like rivers.

Because of the complexities, EPA and the States have not yet developed clear guidelines for lakes, specifically, what variables to monitor for particular objectives or how best to analyze and present the results. An EPA workgroup composed of representatives from universities, States, and Federal agencies is currently working on these issues. Recommendations from this group will help guide future lake monitoring programs and will help make different organizations' assessments of use support more comparable. Other interagency groups are working on recommendations for ground water and wetlands monitoring and assessment protocols. Future versions of this report should summarize lake, ground water, and wetlands information using these assessment guidelines.

from consuming unsafe quantities of contaminated fish caught in certain waters. States issue advisories if monitoring data indicate that concentrations of toxic contaminants in fish tissue samples exceed State and Federal criteria. The criteria for issuing advisories may vary from State to State. Therefore, neighboring States may issue different advisories for interstate waters that flow between them, which can confuse the public.

Figure 14 illustrates the distribution of fish consumption advisories across the basin. Each circled number in Figure 14 represents a specific advisory. More specific information on each advisory is

Figure 12. Contact Recreation Use Support: Percentage of Pollutants and Their Sources



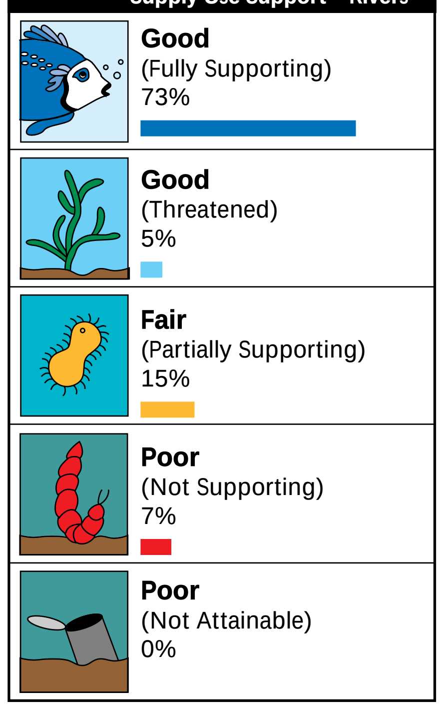
Why Monitor? Why Report?

Water quality monitoring is technically demanding and expensive. Furthermore, ideas about what indicators should be monitored and how to interpret the results continue to change. So why should we invest public funds in monitoring, and who wants the information that is produced?

The Intergovernmental Task Force on Monitoring Water Quality (ITFM) defined monitoring as "... an integrated activity for evaluating the physical, chemical, and biological character of water in relation to human health, ecological conditions, and designated water uses." It went on to say that monitoring "... is a means for understanding the condition of water resources and providing a basis for effective policies that promote the wise use and management of this vital resource" (ITFM, 1992).

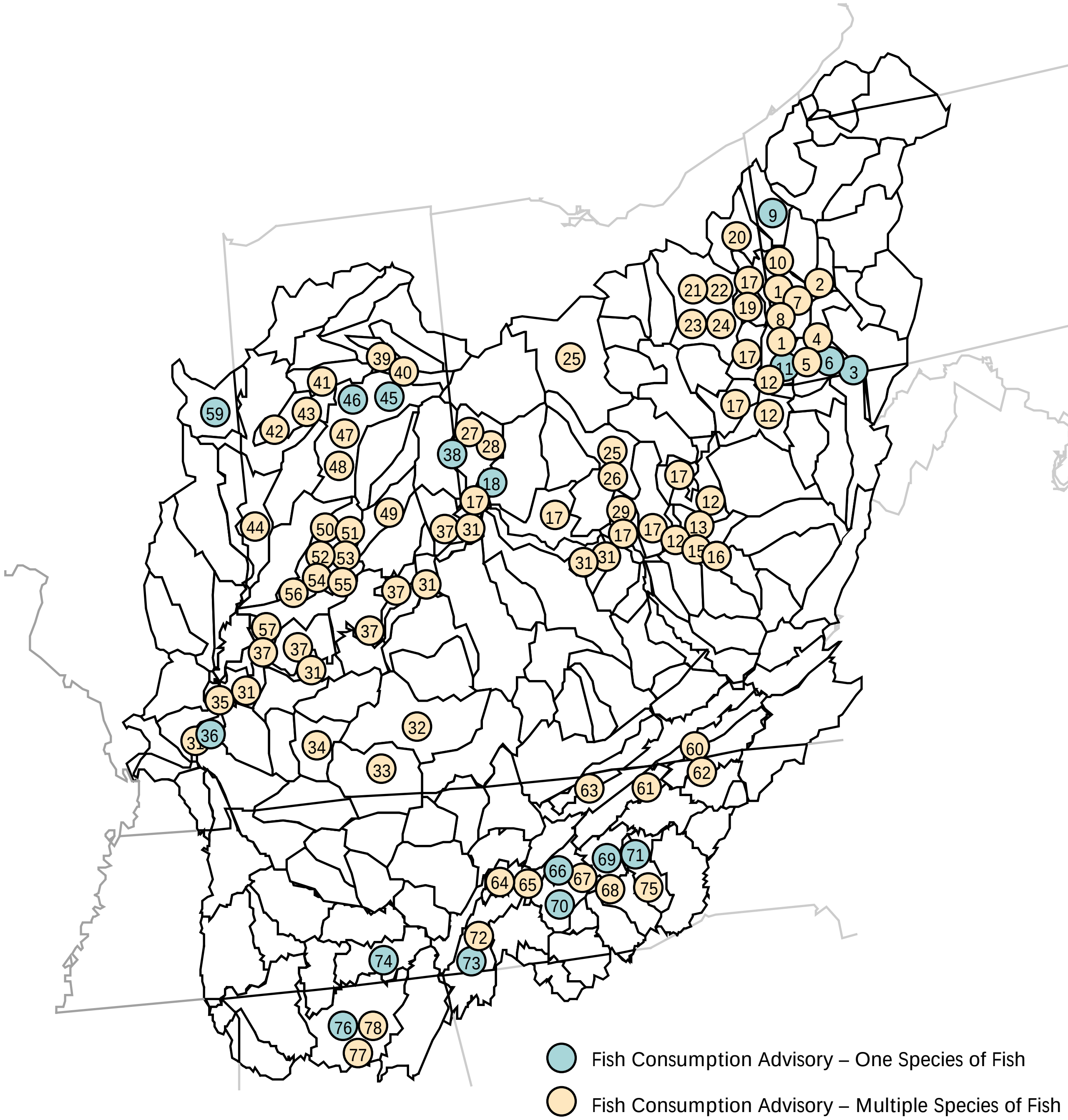
This link with resource management policies is why water quality monitoring is important. Monitoring provides information that helps set policies and programs to protect and improve the quality of our Nation's streams, rivers, and lakes. It provides a basis for prioritizing needs so limited funds can be effectively allocated to improve conditions. Monitoring also provides the basis both for determining whether those policies and programs actually result in measurable environmental improvements, and for changing policies and programs to increase their effectiveness. Because funding required for water quality protection and improvement is large, and because protection and improvement activities can have profound implications to private citizens, water quality monitoring is a sound investment to guide development and ensure effectiveness of water quality policies and programs.

Figure 13. Levels of Drinking Water Supply Use Support – Rivers



Source: Based on 1994 State Section 305(b) reports.

Figure 14. Fish Consumption Advisories – Ohio and Tennessee River Basin



Specific information for each numbered advisory is provided in Appendix A.

Source: EPA National Listing of Fish Consumption Advisories, September 1994.

provided in Appendix A. Currently, 78 advisories are in effect in the Ohio and Tennessee River basin. Twenty-seven advisories restrict the consumption of all fish species; 19 restrict consumption of one fish species. Carp and catfish are the subject of more advisories than any other fish species; 70 advisories restrict consumption of carp and/or catfish. The most common pollutants responsible for fish consumption advisories are PCBs and chlordane. Metals (particularly mercury), dioxin, and other pollutants account for the remainder of the advisories. Several advisories have been issued for combinations of two or more contaminants.

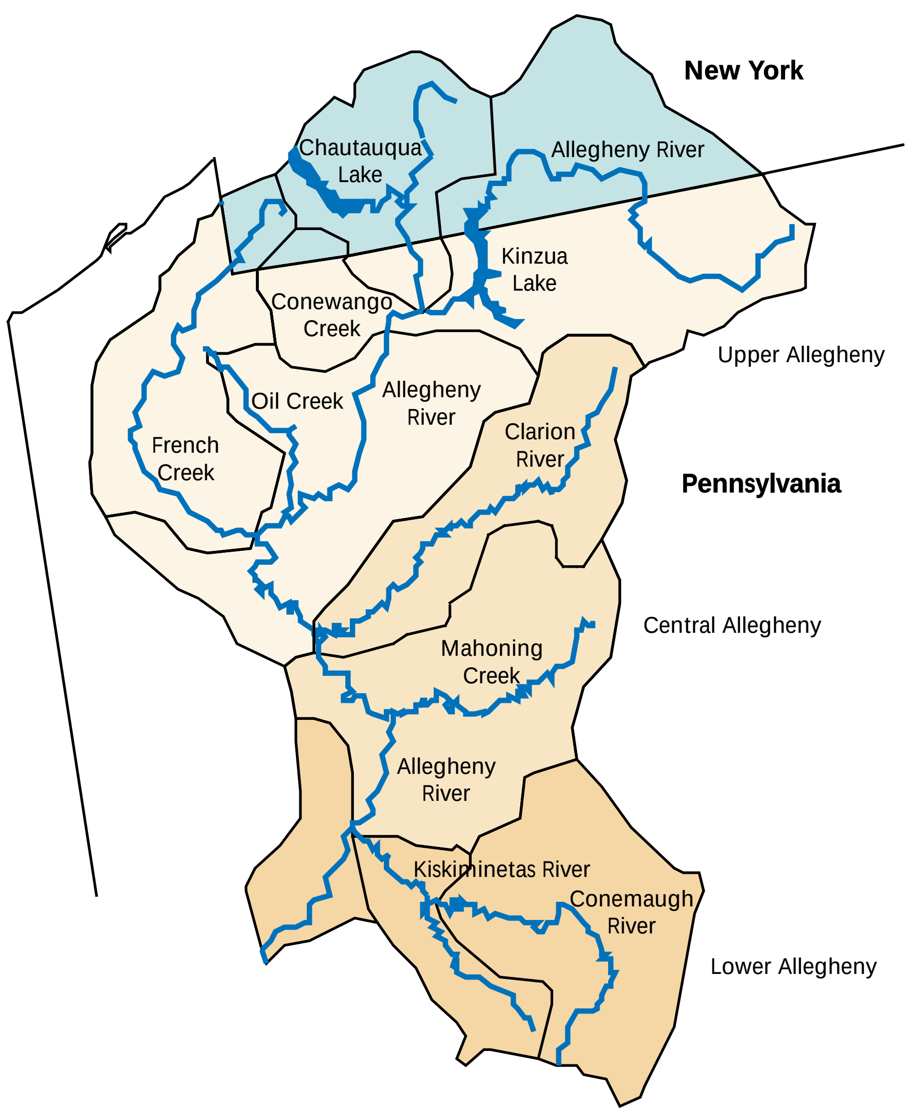
The Allegheny River Subbasin

Background

The Allegheny River drains just over 11,500 square miles of the headwaters of the Ohio River basin in the States of New York and Pennsylvania (Figure 15). It contains about 14,000 stream miles, of which 10,162 miles are classified as perennial. The Allegheny River originates in the mountains of north-central Pennsylvania, then flows northwest into New York, turns southwest, and reenters Pennsylvania. From its headwaters, the Allegheny flows 325 miles to its mouth in Pittsburgh, where it joins with the Monongahela River to form the Ohio River. Major tributaries include the Kiskiminetas River, Conemaugh River, Clarion River, Conewango Creek, and French Creek.

Mining and manufacturing are the major economic activities within the subbasin, followed by agriculture and forestry. Coal, oil, natural gas, sand, gravel, limestone, sandstone, clay, and shale are extracted from the subbasin. Principal manufacturing products include petroleum and coal, rubber and plastic products, stone and clay products, primary and fabricated metals, leather and apparel, and electrical and other machinery. In the southern portion of the subbasin, a chain of industrial river valleys and mining towns wind

Figure 15. Allegheny River Basin



westward toward Pittsburgh, the industrial heart of the subbasin. Due to the decline of the coal industry and the mechanization of mines and steel mills, unemployment is a significant problem in these areas.

State Assessment Techniques

New York and Pennsylvania use different terms and assessment methods to rate use support status in their rivers and streams. Pennsylvania rates its waters as either fully supporting, partially supporting, or not supporting designated uses. New York rates its waters as threatened, stressed, impaired, or precluded.* To consolidate the data from the two States, ORSANCO and TVA assumed that "threatened" waters in New York are comparable to "fully supporting" waters in Pennsylvania, "stressed" and "impaired" waters are comparable to "partially supporting" waters, and "precluded" waters are comparable to "not supporting" waters (Table 1).

New York and Pennsylvania also use different criteria for interpreting water quality data. Differences in State assessment criteria can have dramatic effects on interstate water quality assessments. Based on different criteria, each State may assign different use support ratings to streams with very similar water quality. As a result, a stream that crosses the State border may fully support uses in Pennsylvania and partially support uses after it flows into New York, even though water quality data are the same on both sides of the State border. EPA is working with the States to address inconsistent assessment criteria (see Special State Concerns and Recommendations).


ORSANCO

Aquatic Life Use

Over 6,600 miles (65%) of perennial rivers and streams in the Allegheny River subbasin were assessed for the 1994 305(b) reporting cycle. Of the streams that were assessed, 72% (3,851 miles) fully support aquatic life use, 12% (660 miles) partially support aquatic life use, and 15% (820 miles) do not support aquatic life use.

ORSANCO and TVA also rated aquatic life use support status in individual watersheds in the Allegheny River subbasin (Figure 16) using the same criteria developed for ranking watersheds basin-wide in Figure 4. One feature that clearly stands out is the sharp contrast between aquatic life use support ratings in watersheds that straddle the border between Pennsylvania and New York. In New York, most of the border watersheds have an intermediate aquatic life use support rating. In contrast, the same watersheds have the best rating on the Pennsylvania side of the border. This State line fault is most likely due to differences in State water quality assessment criteria rather than real differences in water quality.

Within Pennsylvania, the streams with the best aquatic life use support ratings are located in

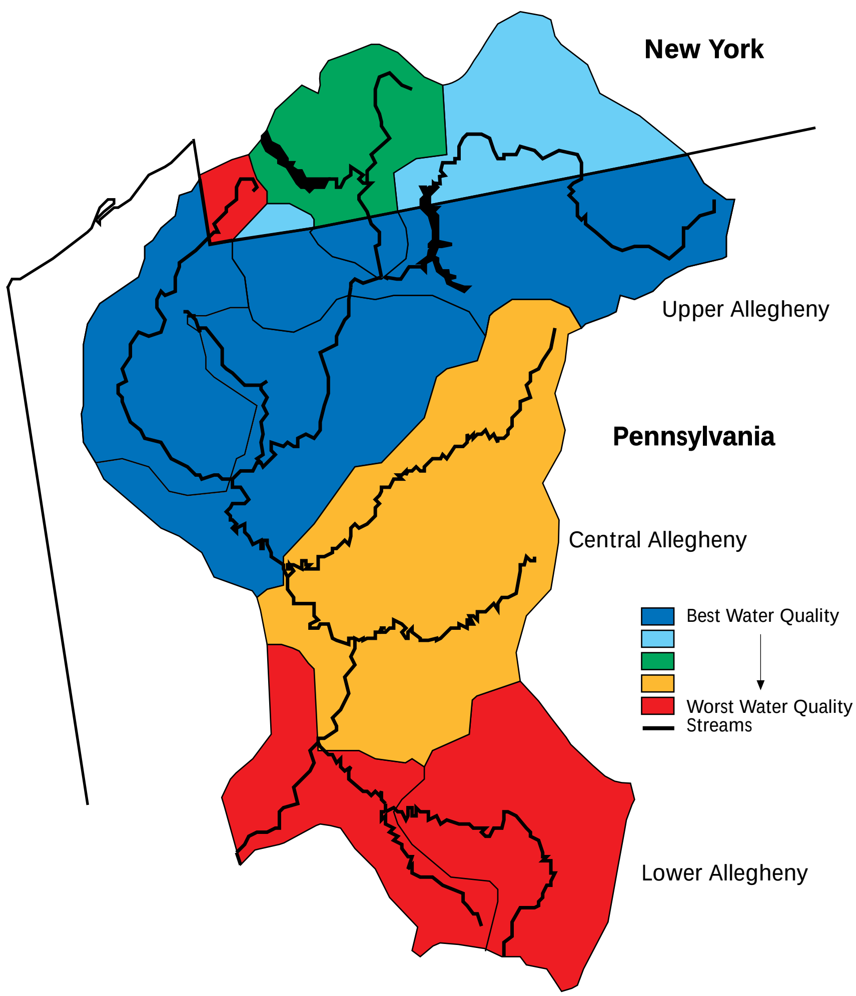
Table 1. Equivalent Use Support Ratings in New York and Pennsylvania

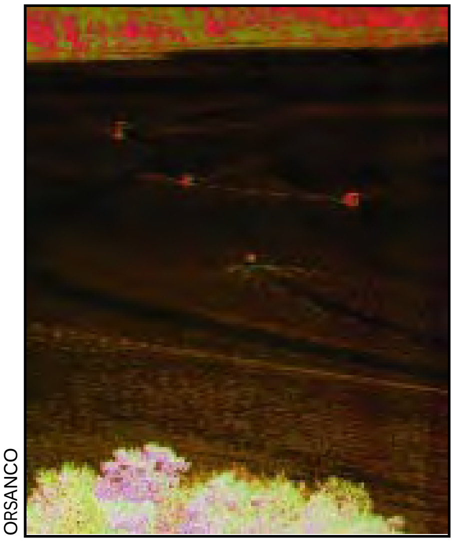
New York Ratings	Pennsylvania Ratings
Threatened	Fully Supporting
Stressed	Partially Supporting
Impaired	Partially Supporting
Precluded	Not Supporting

* According to New York's terminology, threatened streams fully support designated uses but could become impaired in the future due to existing activities. Impaired stream segments partially support one or more uses, and stressed streams are intermittently impaired. Precluded streams do not support one or more uses.

the upper Allegheny River and French Creek watersheds. The Clarion River and middle Allegheny River watersheds are slightly more impaired, while the lower Allegheny River watershed, including the Conemaugh and Kiskiminetas Rivers, is the most impaired watershed in the subbasin. It should be noted that the depiction of the New York portion of the French Creek watershed as having the lowest degree of use support is primarily due to differences in the States' use support ratings and the problems that follow when trying to compare separate sections of an interstate watershed.

Figure 16. Allegheny River Subbasin – Aquatic Life Use





ORSANCO

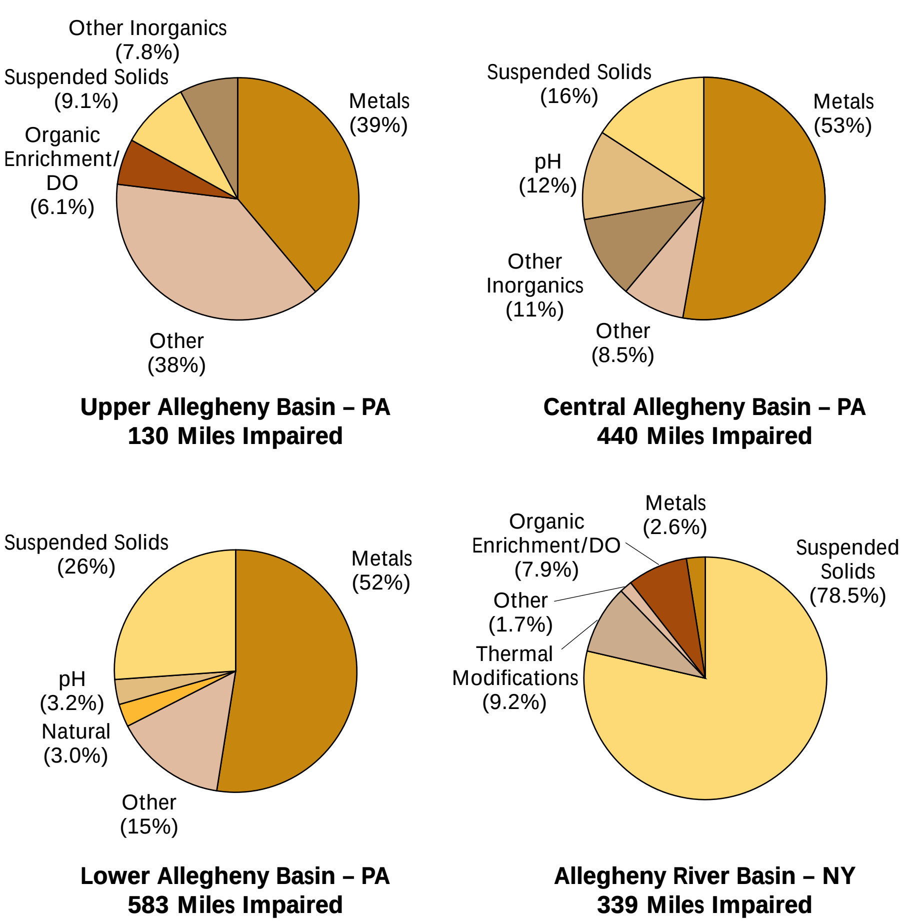
Approximately 56% of the assessed stream miles in the French Creek watershed were identified as "stressed" by New York, which, for the purposes of this report, were assumed to be equivalent to "partially supporting" streams (the use designation utilized by Pennsylvania). However, if the use support ratings were further defined, the "stressed" stream miles could be classified as having only minor partial impairment, which would most likely result in a better use support rating for the watershed.

Pollutants and Their Sources

Both States identified specific pollutants and sources of pollutants impairing rivers and streams. Figure 17 presents the percentage of stream miles impaired by particular pollutants in four portions of the Allegheny River subbasin, each comprised of several watersheds. Metals are the major pollutant of concern in the Pennsylvania portion of the subbasin, and suspended solids are the most common pollutant identified in the New York portion of the subbasin. New York reported that suspended solids impact over three-fourths of the rivers and streams impaired by identified pollutants. Throughout the entire Allegheny River subbasin, metals are the most common pollutant (impacting 598 stream miles), followed closely by siltation and suspended solids (impacting 547 miles). Other pollutants impacted less than 5% of the impaired rivers and streams.

By far, resource extraction is the largest source of pollution in the Allegheny River subbasin (Figure 18). Throughout the subbasin, resource extraction impacts over 900 miles of streams, nearly all of which are located in Pennsylvania. Of these, 775 miles are impacted by acid mine drainage. Other significant sources of pollution in the subbasin include agriculture (the major pollutant source in the New York portion of the subbasin, which impacts 202 miles) and hydrologic/habitat modifications (impacting 157 miles).

Figure 17. Pollutants of Concern in Impaired Streams – Allegheny River Basin



Additional Stream Uses

ORSANCO and TVA could not rate the status of contact recreation use and drinking water use in the Allegheny River subbasin because Pennsylvania did not report the status of these individual uses in its Section 305(b) report. New York assessed contact recreation and drinking water use support statewide, but in the Allegheny River subbasin, New York's assessed waters included only 42 miles of Conewango Creek (fully supporting contact recreation use) and 7.5 miles of the Allegheny River (partially supporting drinking water supply use).

Fish Consumption Advisories

The only fish consumption advisory in the Allegheny River subbasin advises the public to avoid consumption of carp and channel catfish in the lower 14.5 miles of the Allegheny River (in Pennsylvania) due to contamination by PCBs and chlordane.

Lake Water Quality Assessments

The Allegheny River subbasin contains 665 lakes and reservoirs covering a total surface area of 53,212 acres. Only five of these lakes are larger than 1,000 acres. Six lakes in the subbasin do not fully support designated uses. Nutrients impact five lakes in New

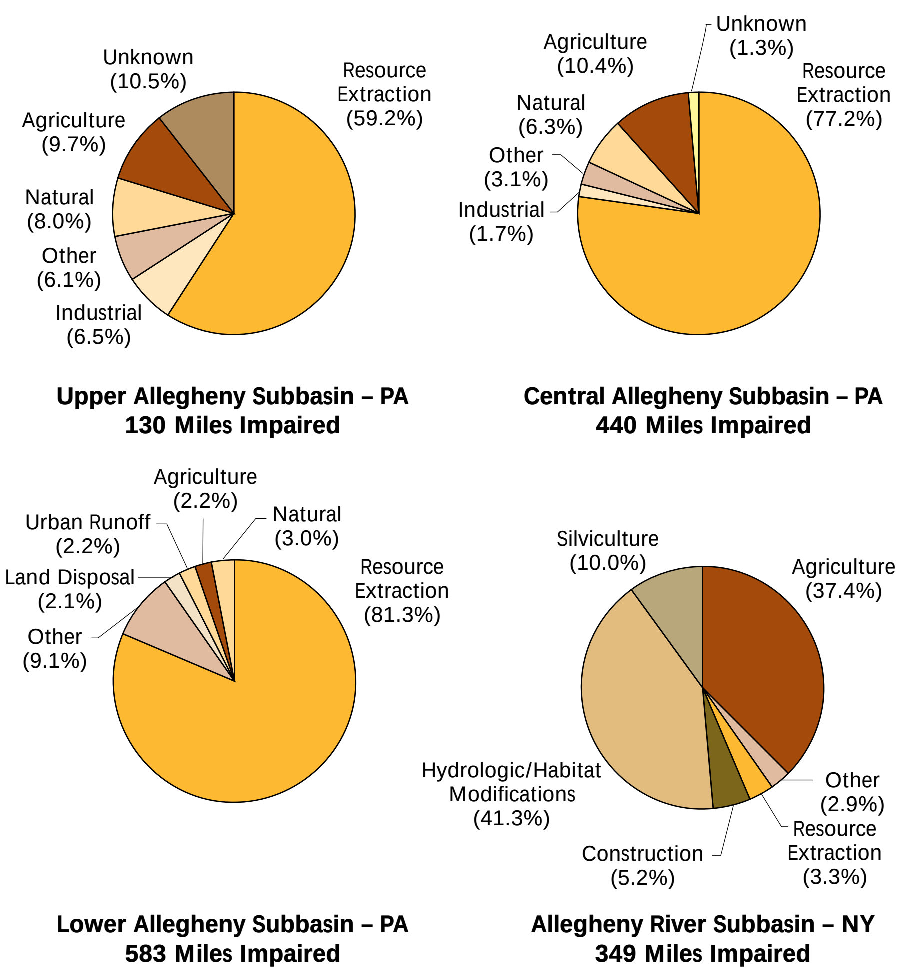
York (totaling 631 acres), and Pennsylvania classified Tamarack Lake (556 acres) as eutrophic. Eight other lakes, covering nearly 17,000 acres, are classified as threatened (by Pennsylvania) or stressed (by New York), including Chautauqua Lake (13,400 acres) and Beaver Run Reservoir (1,125 acres).

New York and Pennsylvania used Carlson's Trophic State Index to rate the trophic status of 24 lakes in the Allegheny River subbasin (Table 2). Carlson's Trophic State Index is based on phosphorus, chlorophyll, and water clarity (i.e., secchi disk) data. Carlson's Trophic State Index classifies lakes as oligotrophic (very clear and nutrient poor), mesotrophic (moderate clarity and nutrient content), or eutrophic (relatively murky and nutrient rich). Many eutrophic lakes are naturally nutrient rich and support healthy fish communities, but eutrophic conditions may indicate that a lake is receiving an overdose of nutrients from unnatural sources.

Pennsylvania classified eight lakes as eutrophic and eight lakes as mesotrophic, including Kinzua Lake (12,100 acres). New York rated three lakes as mesotrophic and five lakes as eutrophic, including Chautauqua Lake. None of the lakes in the subbasin were classified as oligotrophic.

As of 1995, EPA had sponsored studies on two lakes in the Allegheny River subbasin, Chautauqua Lake in New York and Conneaut Lake in Pennsylvania. An ongoing study on Chautauqua Lake, the largest lake in the subbasin, is identifying pollutant sources and evaluating lake protection options. Weed growth and algal blooms in Chautauqua Lake are the greatest concerns, while construction impacts have also been high due to the intensive development in the area. Conneaut Lake once was a popular tourist attraction but now has nuisance levels of aquatic weeds and severe oxygen depletion. A study in progress for Conneaut Lake is determining pollutant budgets for phosphorus, nitrogen, and suspended solids to help in drafting a management plan.

Figure 18. Sources of Pollution in Impaired Streams – Allegheny River Subbasin



Special State Concerns and Recommendations

Ten States reported special water quality concerns and/or recommendations for improving water pollution control programs in their Section 305(b) reports. The following five issues were listed by three or more States; some of the issues are especially relevant to the Ohio and Tennessee River basin, but all five issues are applicable to water quality assessments at the State, watershed, basin, or national level.

1. The need for coordinated efforts to address nonpoint sources of pollution.
States noted the complexities of controlling pollution that originates from numerous diverse sources, each of which contributes a small amount of pollution. Coordination among different agencies and the different layers within government agencies—Federal, State, local, and regional—is critical to avoid duplication of efforts and conflict among programs. Agencies need to consider the effects of waste generation and disposal on the total environment in their regulatory decisions.

Table 2. Trophic Status of Allegheny River Subbasin Lakes

Mesotrophic		Eutrophic	
Lake	**Acres**	**Lake**	**Acres**
Conneaut Lake (PA)	929	Bear Lake (NY)	44
Cuba Lake (NY)	184	Beaver Run Reservoir (PA)	1,125
Hemlock Lake (PA)	NR	Canadohta Lake (PA)	170
Justus Lake (PA)	NR	Cassadaga Lake, Lower (NY)	34
Keystone Lake (Westmoreland County, PA)	880	Cassadaga Lake, Upper (NY)	41
Keystone Lake (Armstrong County, PA)	78	Chautauqua Lake, North (NY)	5,434
Kinzua Lake (PA portion)	12,100	Edinboro Lake (PA)	240
Quaker Lake (NY)	92	Findley Lake (NY)	124
Quemahoning Reservoir (PA)	900	Hinckston Reservoir (PA)	NR
Red House Lake (NY)	44	Loyalhanna Reservoir (PA)	210
Saltlick Reservoir (PA)	NR	North Park Lake (PA)	75
		Tamarack Lake (PA)	556
		Yellow Creek Lake (PA)	740

NR = Not reported.

2. A coordinated framework for ground water protection.
A number of Federal and State agencies have authority and responsibility for ground water protection. To coordinate their efforts, several States are developing ground water management strategies that set forth overall objectives and principles and define each agency's role.

3. Pollution from resource extraction.
In the *1994 National Water Quality Inventory Report to Congress*, the 14 Ohio and Tennessee River basin States accounted for almost half of the river miles reported as impaired due to resource extraction. Most of the impairment was attributed to mine drainage, while a much smaller portion was related to oil and gas drilling. The States note that inadequate funding to address pollution from abandoned mines is a special concern.

4. Human health criteria.
Several States raised concerns about criteria to protect human health from contamination in water and fish. These States identified a need to establish criteria for additional harmful substances and additional guidance on the use of criteria. The States are particularly concerned that changing to risk-level-based criteria will result in many new locations being classified as impaired for fish consumption or water supply use.

5. Watershed planning and management. Several States reported on their own initiatives toward watershed-based pollution abatement programs. The States expressed concern that a transition to a watershed approach might disrupt or delay current programs. The States consistently requested that EPA provide incentives for States to adopt watershed-based approaches.

Recommendations for Reporting from a Basinwide Assessment Perspective

Inconsistencies in the States' 305(b) information presented obstacles to developing this water quality assessment of a large, interstate basin. The inconsistencies included the geographic bases of the assessments, the designated uses assessed, the identification of causes and sources of use impairment, and the assessment methodologies themselves. State-to-State differences in assessment methods, interpretation, and reporting must be reduced if information in future Section 305(b) reports is to be aggregated into large regional or interstate basin assessments of water quality conditions. The following section describes several recommendations to address these problems.

Assessment by Watershed

Some States present their assessments on a statewide basis, some provide summaries by large watersheds, and others present information for individual streams. To facilitate reporting on an interstate basis, States need to report their information at a consistent level of watershed units. Watersheds identified by USGS 8-digit HUCs should be the minimum reporting units. States may choose to aggregate their information by smaller watershed units (i.e., 11-digit HUC codes), or they may, in some instances, combine adjacent units where necessary for their own reporting purposes.

Assessment of All Designated Uses

Many States assess only aquatic life use support; others report a single, overall use support assessment that is usually based on aquatic life use support status. Since the goal of the Clean Water Act is for all waters to support aquatic life and recreation, each State should at least address both of these uses. The lack of information on water supply use support probably results from a historic separation of programs that address water supply issues and water pollution control. The absence of such information in a report on water quality conditions, however, is difficult to justify. At a minimum, States should assess waters that serve as sources for public supplies. To improve reporting of fish consumption use support status, EPA should request that the States identify the watershed in which each advisory occurs. EPA already requests that each State submit a list of fish consumption advisories, but EPA does not currently request watershed identification with this information.

Causes and Sources of Use Impairment

Most States report causes and sources of use impairment, but many do so only on an overall basis; most do not identify the individual use impaired by a cause or source. Some States report the total waters impaired by causes and sources statewide and do not identify the size of waters impaired by causes and sources in individual watersheds. Most States cannot identify the causes and sources responsible for degrading all of their impaired waters. These inconsistencies seriously compromise any effort to report such information on a multistate basis. EPA's 305(b) Consistency Workgroup should address these issues and develop appropriate recommendations.

Consistent Assessment Methodologies

Assessments of lakes, ground water, and wetlands were extremely inconsistent among the 14 States that share the Ohio and Tennessee River basin. EPA's guidelines for preparing the Section 305(b) reports are less precise for lakes, wetlands, and ground water than for rivers and streams; as a result, States have developed their own approaches for assessing these waters. If interstate basins are to be a basis for reporting in future national water quality summaries, it will be necessary to fine-tune reporting requirements for lakes, wetlands, and ground water.

Even though the assessment methods for rivers and streams are clearly specified in the 305(b) guidelines, this report shows that there are differences in how the States interpret and apply the guidelines. This was noted in the section on the Allegheny River subbasin where waters of similar quality conditions received very different assessments by the States of New York and Pennsylvania. It also was apparent in several other instances where abrupt changes in the level of use support appeared to occur at State lines.

States arrive at different use support ratings because the States monitor different water quality indicators and use different use support criteria. For example, some States base their aquatic life use support assessments primarily on biological survey results while others use only physical and chemical data. Studies have shown that biological monitoring data often detect more water quality impairments than chemical and physical monitoring data alone. In addition, States can arrive at different use support ratings if some States monitor dissolved metals concentrations while others continue to measure total recoverable metal concentrations. Even if neighboring States monitor comparable indicators and use similar criteria, they may be evaluating information collected in different years.

Contact recreation use is assessed primarily on the basis of bacteria levels, but the States base their recreation use support ratings on a variety of indicator bacteria. Some States have adopted criteria for *E. coli* and/or Enterococcus while others continue to monitor fecal coliforms. Support of public water supply use is subject to greater inconsistencies. For water supply utilities, the parameters regulated under the Federal Safe Drinking Water Act are most important. Many of those parameters are not specifically regulated under the Clean Water Act and are not routinely monitored by State water quality agencies.

EPA's 305(b) Consistency Workgroup has addressed several of these issues in the 305(b) guidelines for the 1996 report cycle.

Initiating Watershed Assessments

All of the difficulties and inconsistencies described above can be overcome if they are addressed early in the assessment process. Where river basin organizations exist, they are ideally suited to take a lead role in coordinating interstate watershed assessments. The process used by ORSANCO to prepare a Section 305(b) report for the Ohio River mainstem on behalf of six States might serve as an example. Preparation for the Ohio River assessment begins 7 months prior to the April due date for the report. A proposed outline of the assessment, including descriptions of the methodologies to be used, is distributed to the States and is discussed in one or more teleconferences. A preliminary draft is distributed approximately 3 months before the due date and, if comments warrant, is discussed in another teleconference.

For watersheds where an interstate river basin agency does not exist, it may be necessary for the EPA Region to take the lead role in coordinating the States' assessments. Regardless of who assumes the lead role, coordination early in the process will result in more consistent and comprehensive assessments.