Section II

Basinwide Survey:
Ohio and Tennessee River Valley

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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

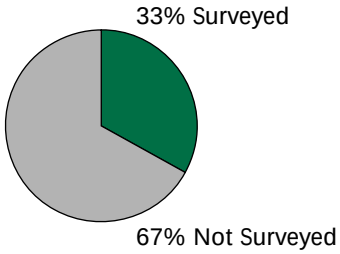
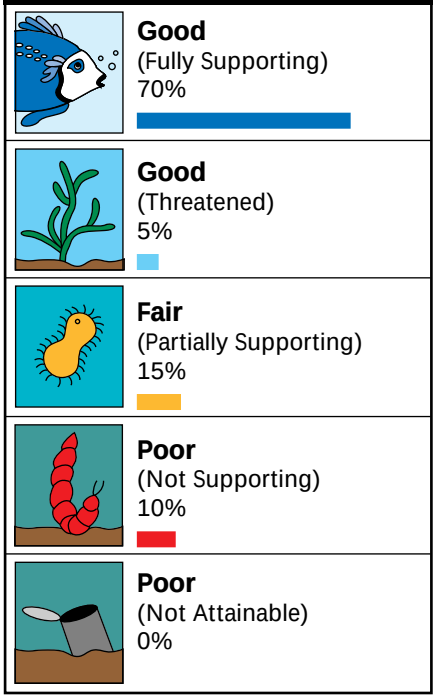


Figure 3. Levels of Overall Use Support – Rivers



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.

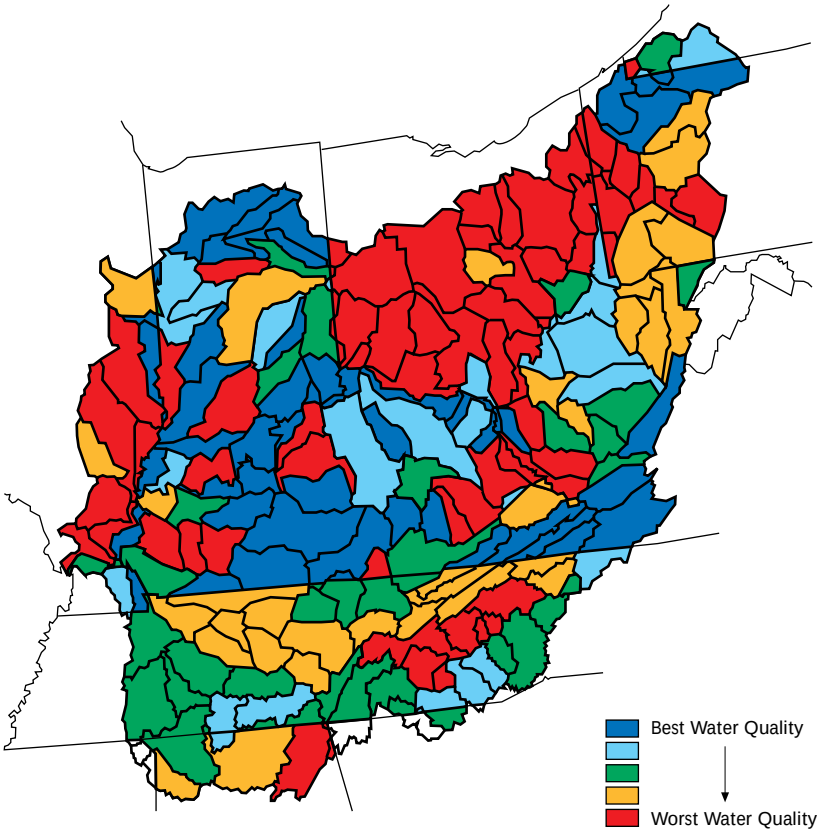
NOTE: For this report, ORSANCO, TVA, and EPA assumed that overall use support information in the Section 305(b) reports and the Waterbody System represents aquatic life use support information. Overall use support is a combined measure of how well a waterbody supports all of its individual uses. Overall 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.

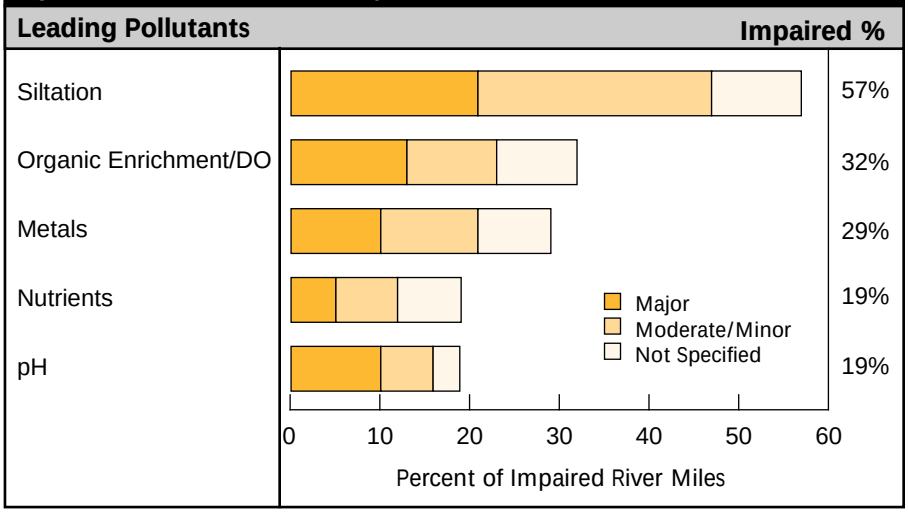
Another example of how differences in State assessment methods affect the use support assessments can be seen along the Kentucky-Tennessee border. Here, the aquatic life use attainment in the Kentucky portion of the Cumberland River watershed is designated as "best," while the Tennessee portion of the 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.

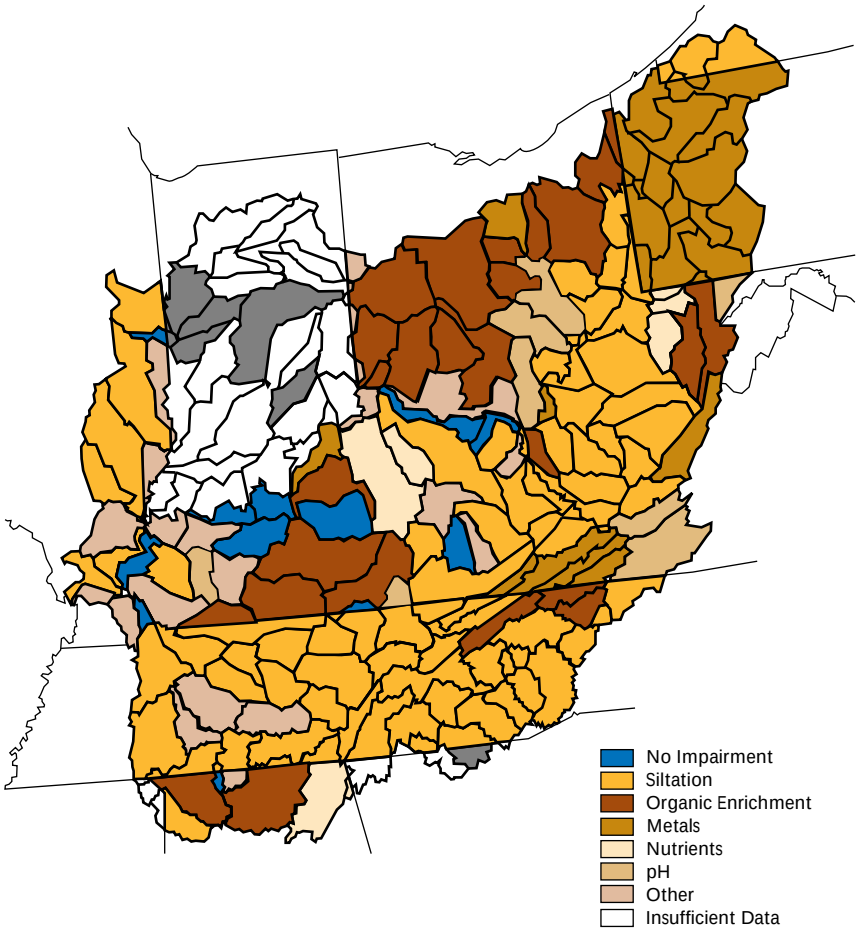
Based on data submitted by 11 States, ORSANCO and TVA identified the most common pollutant in each of the watershed units throughout the basin (Figure 6). Insufficient data were available to determine the major pollutants in Indiana, Georgia, and Mississippi. Figure 6 illustrates that siltation is the 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 7. Sources of Pollutants Found in Surveyed Rivers and Streams

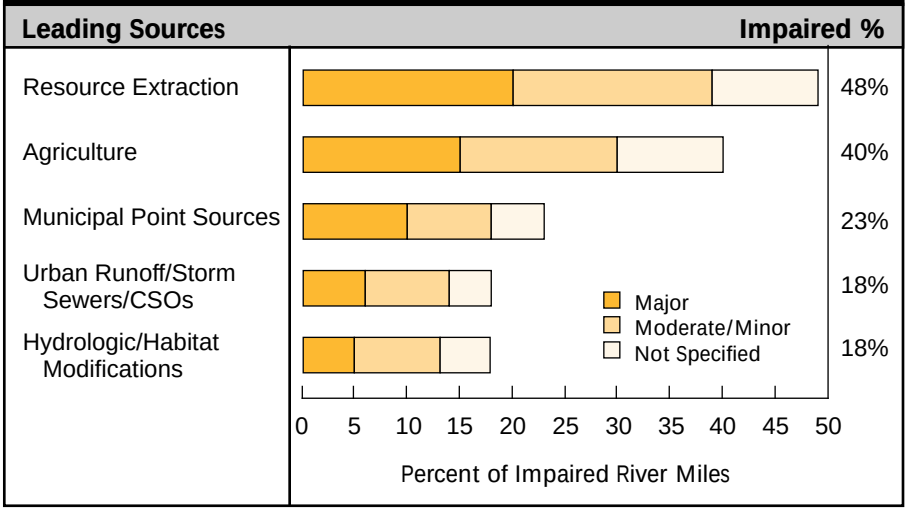


Figure 8. Resource Extraction Activities Polluting Rivers and Streams

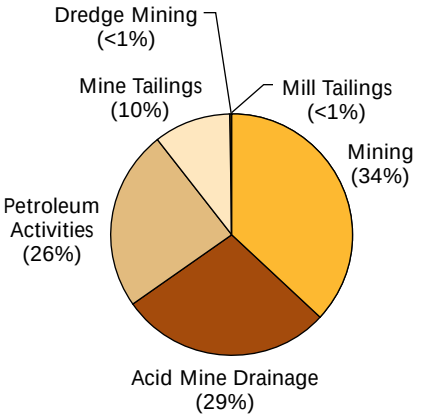
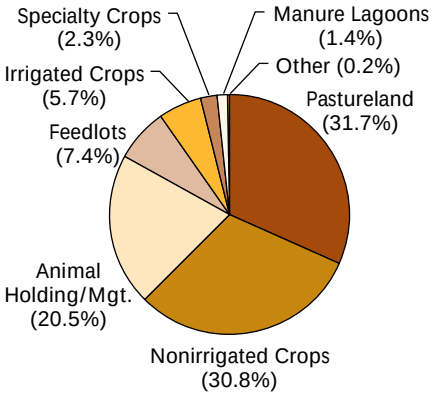


Figure 9. Agricultural Activities Polluting Rivers and Streams



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

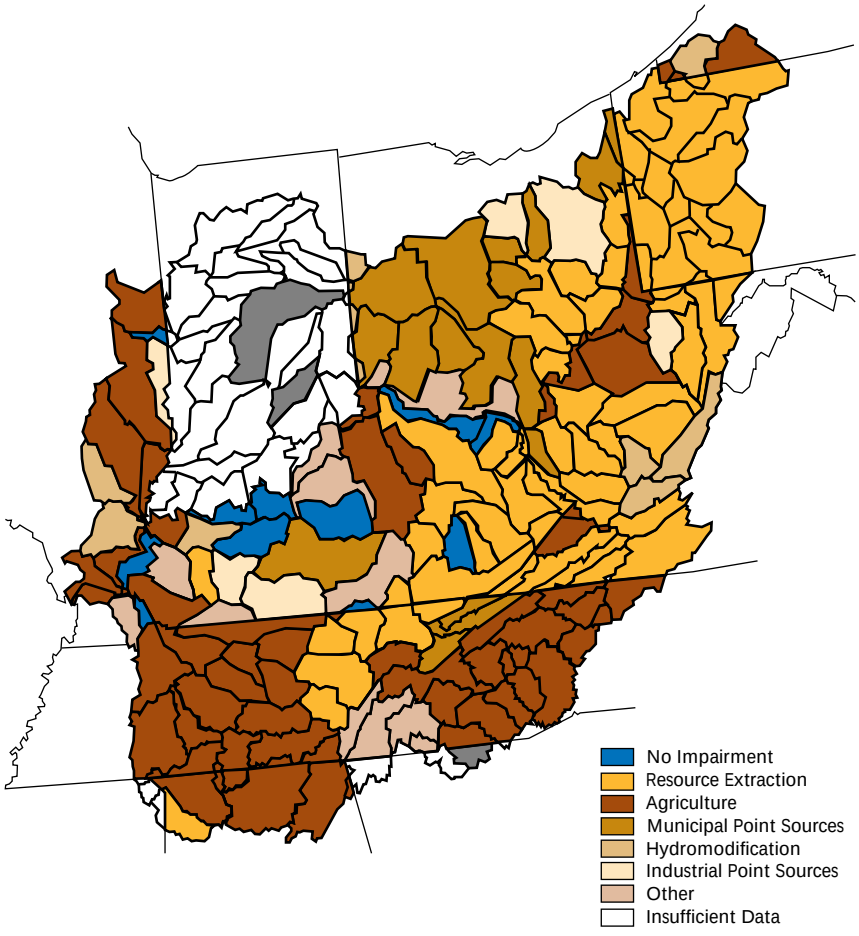
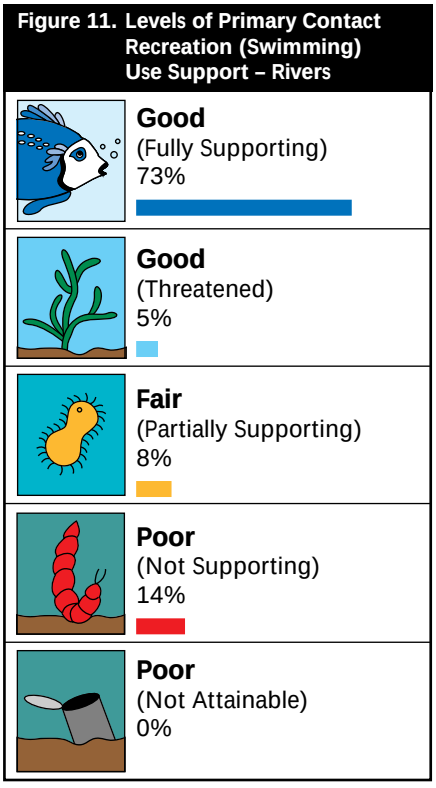


Figure 11. Levels of Primary Contact Recreation (Swimming) Use Support – Rivers



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

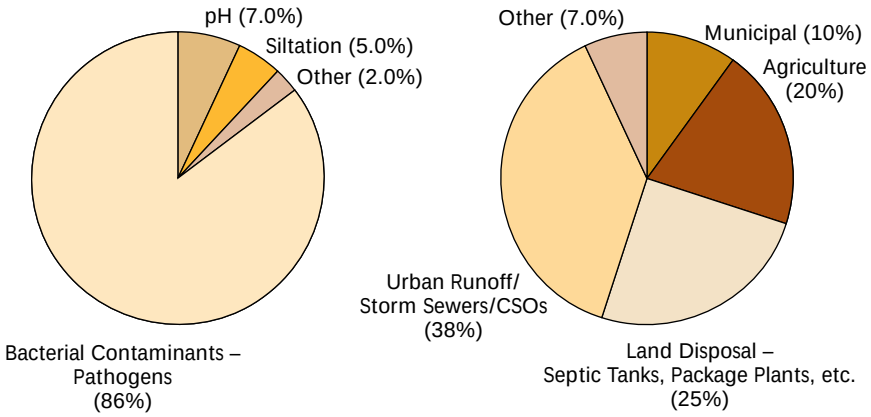
Where Are Lakes, Wetlands, and Ground Water?

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.

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?

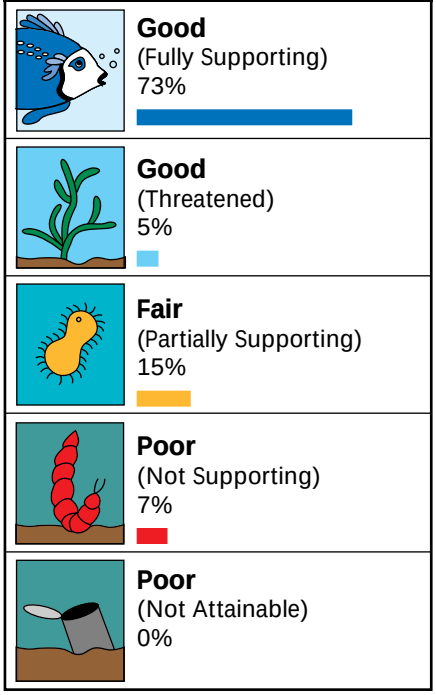
The Intergovernmental Task Force on Monitoring Water Quality (ITFM) defined monitoring as ". . . an integrated activity for evaluating the physical, chemical, and biological character of water in relation to human health, ecological conditions, and designated water uses." It went on to say that monitoring ". . . 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.

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.

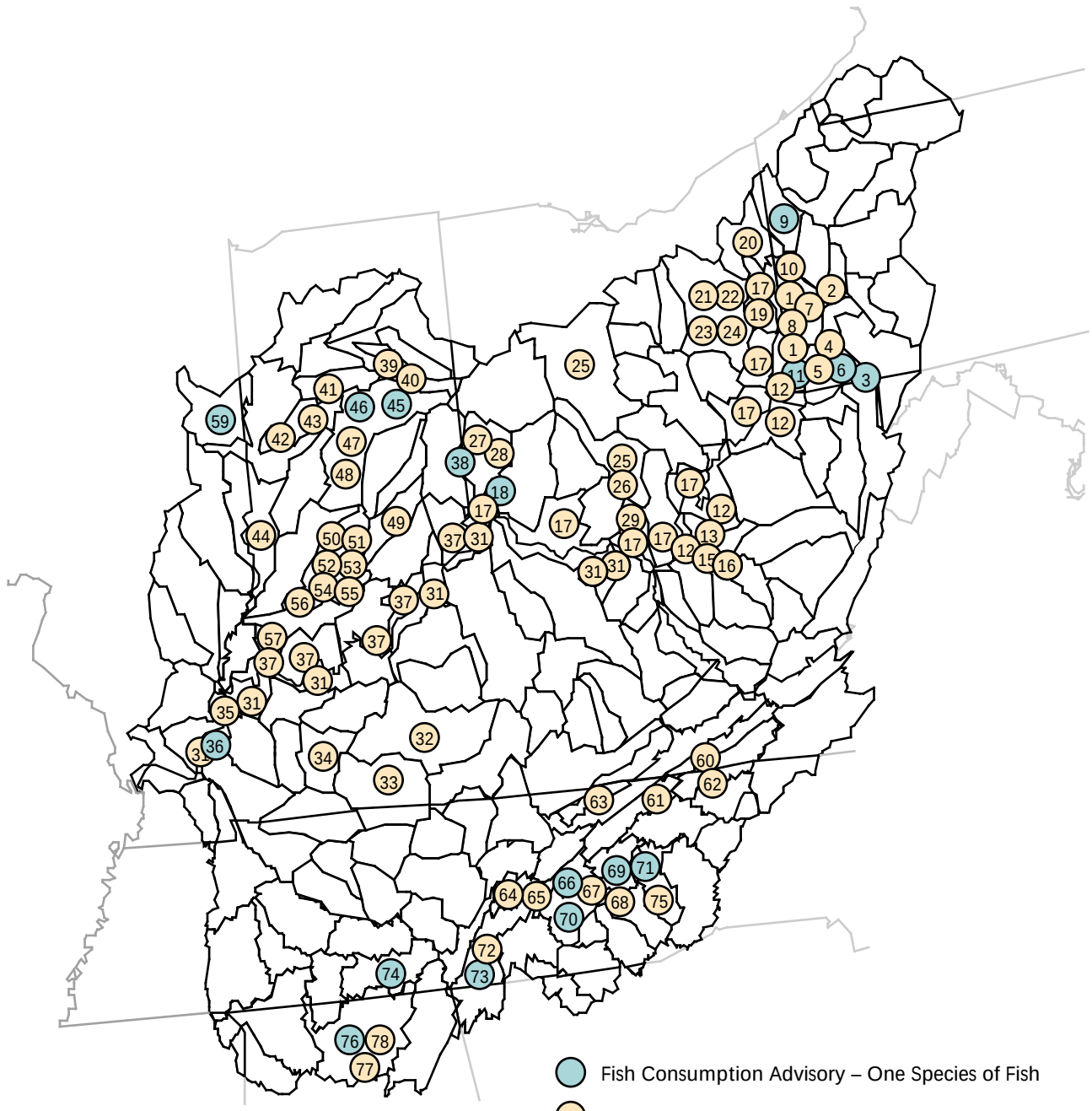
Figure 14 illustrates the distribution of fish consumption advisories across the basin. Each circled number in Figure 14 represents a specific advisory. More specific information on each advisory is

Figure 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



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.

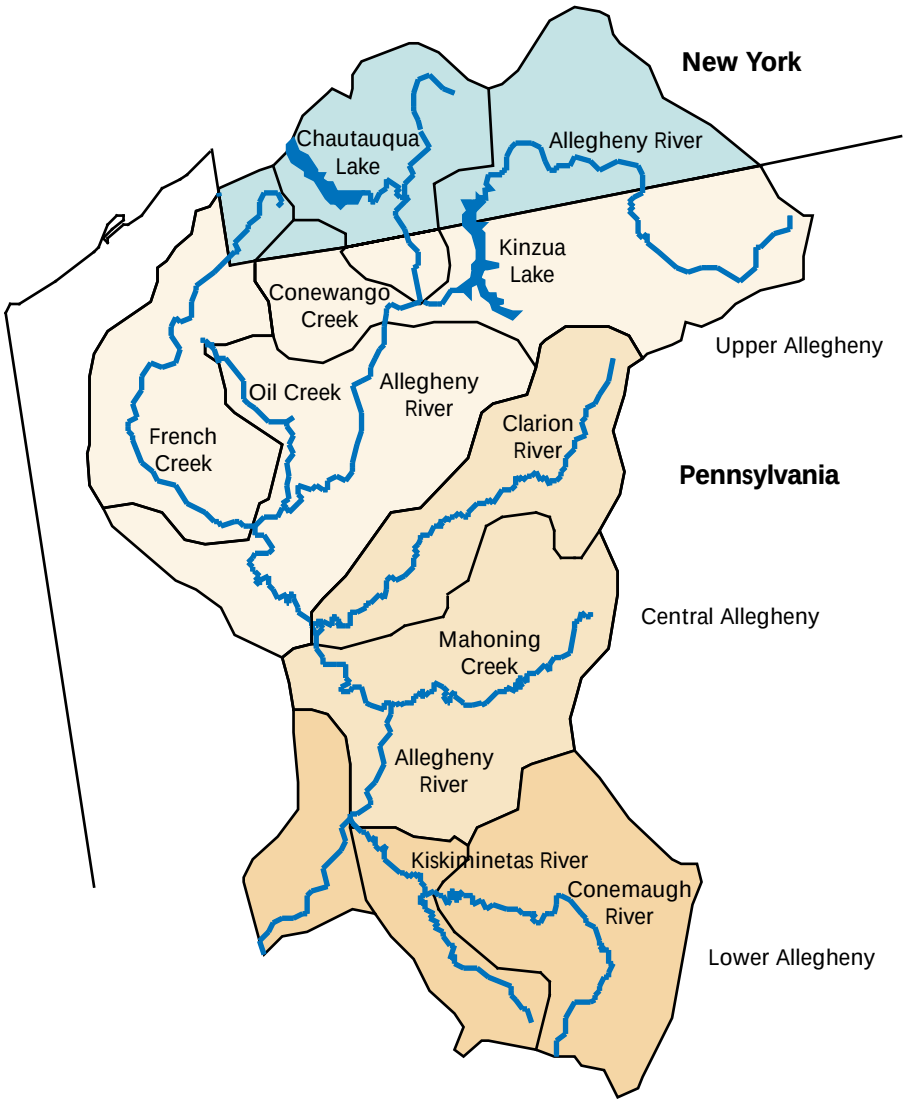
The Allegheny River Subbasin

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).

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 basinwide 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

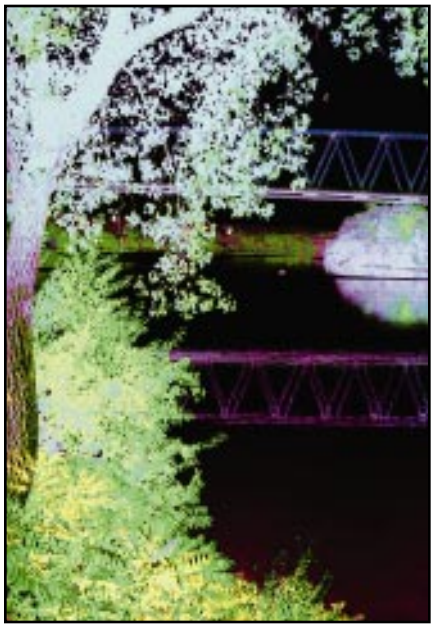


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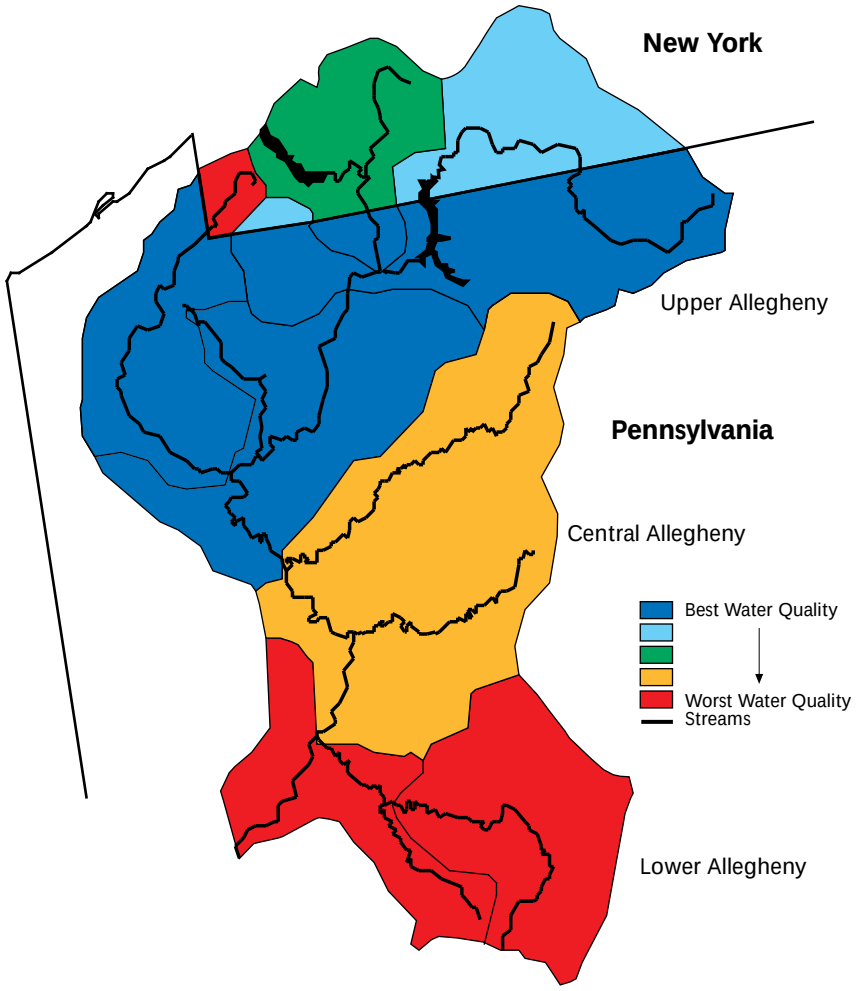
Table 1. Equivalent Use Support Ratings in New York and Pennsylvania

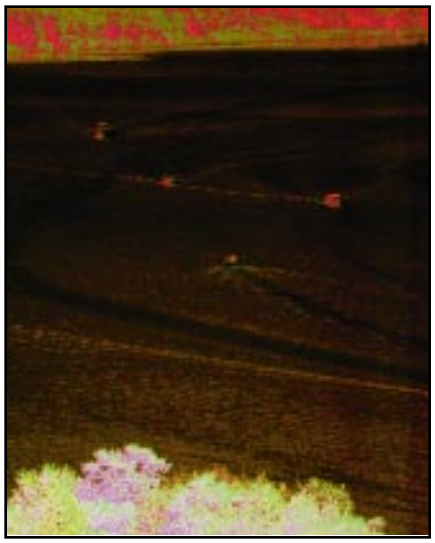
New York Ratings	Pennsylvania Ratings
Threatened	Fully Supporting
Stressed	Partially Supporting
Impaired	Partially Supporting
Precluded	Not Supporting

* 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





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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.

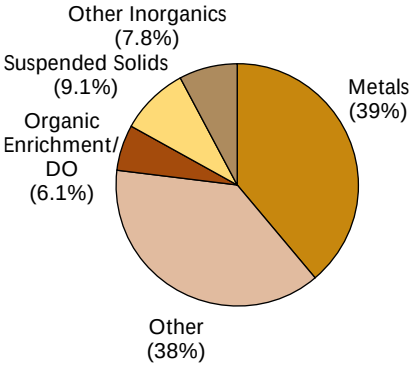
Pollutants and Their Sources

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

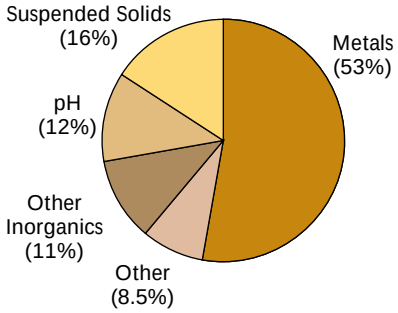
concern in the Pennsylvania portion of the subbasin, and suspended solids are the most common pollutant identified in the New York portion of the subbasin. New York reported that suspended solids impact over three-fourths of the rivers and streams impaired by identified pollutants. Throughout the entire 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).

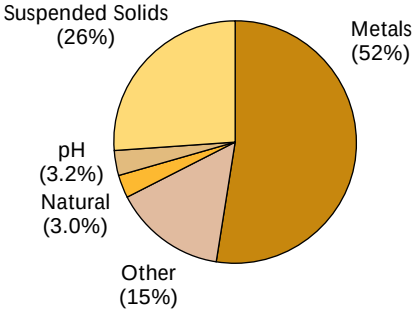
Figure 17. Pollutants of Concern in Impaired Streams – Allegheny River Basin



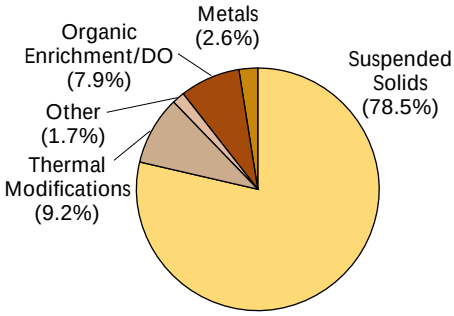
Upper Allegheny Basin – PA
130 Miles Impaired



Central Allegheny Basin – PA
440 Miles Impaired



Lower Allegheny Basin – PA
583 Miles Impaired



Allegheny River Basin – NY
339 Miles Impaired

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

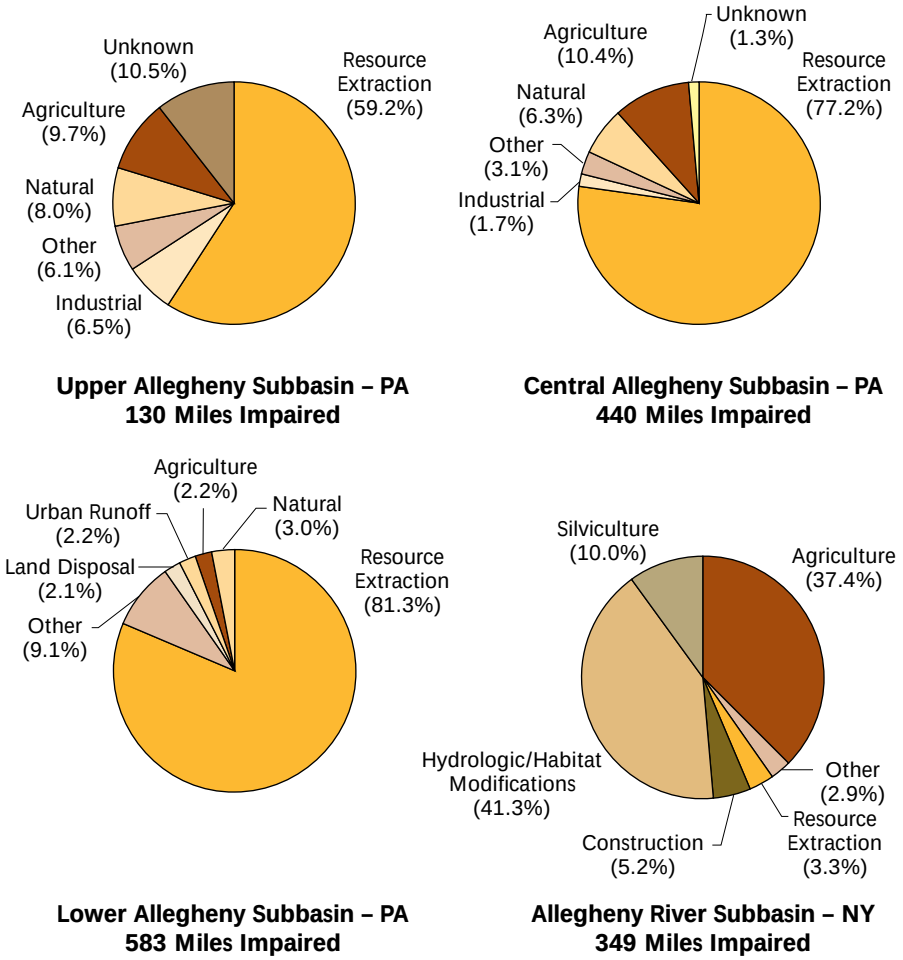
York (totaling 631 acres), and Pennsylvania classified Tamarack Lake (556 acres) as eutrophic. Eight other lakes, covering nearly 17,000 acres, are classified as threatened (by Pennsylvania) or stressed (by New York), including Chautauqua Lake (13,400 acres) and Beaver Run Reservoir (1,125 acres).

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.

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.

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.

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.