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Environmental Protection
Agency

Office of Water (4503F)
Washington, DC 20460

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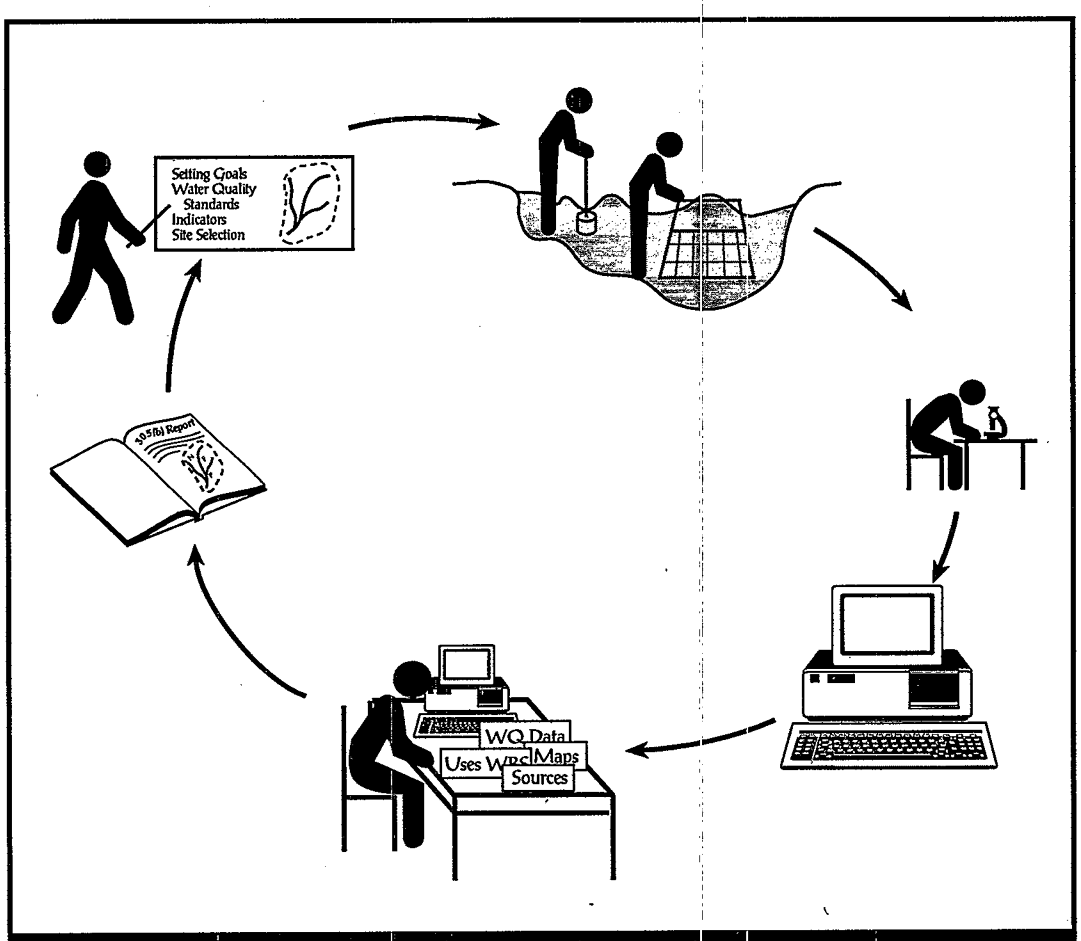
Guidelines for Preparation of the 1996 State Water Quality Assessments (305(b) Reports)



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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

May 19, 1995

OFFICE OF
WATER

MEMORANDUM

SUBJECT: *Guidelines for the Preparation of the 1996 State Water Quality Assessments (305(b) Reports)*

FROM: *Robert H. Wayland III, Director*
Office of Wetlands, Oceans and Watersheds (4503F)

TO: *Addressees*

Attached for your information and use are the Guidelines for the Preparation of the 1996 State Water Quality Assessments (305(b) Reports). These Guidelines reflect continuing efforts by the Environmental Protection Agency (EPA) and States and Tribes through the 305(b) Consistency Workgroup to refine the water quality assessment and reporting process under Section 305(b) of the Clean Water Act.

The 1996 305(b) Consistency Workgroup made several recommendations to improve the 1996 Guidelines for the States and Tribes. The Workgroup consists of representatives from 25 States, 3 Tribes, 6 Federal Agencies, the 10 EPA Regions and Headquarters. The Workgroup met in October 1993, May and October 1994, and had several sub-group meetings and scores of conference calls. The goals of the Workgroup were to improve accuracy and consistency of 305(b) reporting. In particular, we would like to highlight the following significant changes for the 1996 reporting cycle:

- *Transition toward a 5-year 305(b) cycle coupled with a comprehensive characterization of all waters using a variety of monitoring techniques;*
- *A long-term vision for water quality monitoring, assessment and reporting;*
- *Description of the kinds of data used to make aquatic life use and drinking water use determinations;*
- *More specific guidance for ground water and drinking water assessments using environmental indicators; and*
- *Minimal guidance for first-time Tribal reporting.*

The BLUE section of the Guidelines describes the contents of the information to be submitted in individual State reports.

These changes to the Guidelines should have minimal impact on most of the State and Tribal 305(b) programs while adding significantly to the clarity with which we monitor and report aquatic conditions.

We are issuing these Guidelines eleven months before the 1996 State 305(b) reports are due to EPA. By mid-summer of 1995, we will issue the new software for the Waterbody System '96 (WBS96) to the States and Tribes for use in producing their reports (States and Tribes may request a beta test version now if they desire). This additional software will facilitate reporting outlined in the attached Guidelines, but will not delay the development or submittal of the 1996 305(b) reports.

Also attached is a booklet for Tribes. Five Tribes reported on water quality in their 1994 reports. The objective of the booklet is to introduce additional Tribes to 305(b) water quality monitoring, assessment and reporting. Through the 305(b) reports, Tribes can report the status of water quality as well as identifying improvements needed to achieve healthy ecosystems and other Tribal needs, including unique cultural uses.

With the distribution of the Guidelines, we are concurrently convening training sessions for the States and Tribes in each EPA Regional office. The training focuses on State and Tribal reporting following the changes to the 1996 Guidelines and WBS96.

Please ask your Regional 305(b) Coordinators to transmit these Guidelines and Tribal brochure to your States and Tribes, in order to begin preparation of the 1996 305(b) reports. We would especially like to thank members of the Consistency Workgroup (listed in the Acknowledgements section of the Guidelines) for their valuable contributions. If you have any questions concerning the above, please call Barry Burgan, the National 305(b) Coordinator, at (202) 260-7060 [FAX (202) 260-7024]. If you elect to develop supplemental Regional guidance, please be sure to send an informational copy to Barry. His mailing address is U.S. Environmental Protection Agency, 4503F, 401 M Street, SW, Washington, DC, 20460; email burgan.barry@epamail.epa.gov.

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Regional Drinking Water Branch Chiefs
Regional Water Quality Branch Chiefs
Regional Field Branch Chiefs
Regional Oceans and Coastal Branch Chiefs
Regional Tribal Water Quality Coordinators
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Regional Nonpoint Source Coordinators
Regional TMDL Coordinators
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Guidelines for Preparation of the 1996 State Water Quality Assessments (305(b) Reports)

May 1995

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Office of Water

U.S. Environmental Protection Agency
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Acknowledgments

EPA prepared these Guidelines with participation by the 1996 305(b) Consistency Workgroup, whose members are listed on the following page. The full Workgroup met in October 1993 and in June and October 1994 to develop the guidance for the 1996 305(b) cycle. Members also participated in numerous conference calls and subgroup meetings to discuss key technical issues and reviewed drafts of these Guidelines. EPA gratefully acknowledges their efforts, which have significantly improved the 305(b) assessment and reporting process.

Barry Burgan, National 305(b) Coordinator, led the development of these Guidelines and facilitated the efforts of the Workgroup. Research Triangle Institute provided technical support and Tetra Tech, Inc., provided logistical support under EPA Contract 68-C3-0303.

The primary contact regarding these Guidelines is

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ACRONYM LIST

ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
ALUS	Aquatic life use support
AWQMN	Ambient Water Quality Monitoring Network
BMP	Best management practice
CCC	Criteria continuous concentration
CLPMS	Clean Lakes Program Management System
CMC	Criteria maximum concentration
CSO	Combined sewer overflows
CWA	Clean Water Act
CZARA	Coastal Zone Act Reauthorization Amendments
DLG	Digital line graph (database)
DO	Dissolved oxygen
DQO	Data quality objective
EMAP	Environmental Monitoring and Assessment Program
EPA	U.S. Environmental Protection Agency
FDA	U.S. Food and Drug Administration
FIPS	Federal Information Processing Standard
FWS	U.S. Fish and Wildlife Service
GIS	Geographic information system
ITFM	Intergovernmental Task Force on Monitoring Water Quality
LAN	Local Area Network
LWQA	Lake Water Quality Assessment
NAS	National Academy of Science
NAWQA	National Ambient Water Quality Assessment Program
NBS	National Biological Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
NRCS	Natural Resources Conservation Service

OGWDW	Office of Ground Water and Drinking Water
OST	Office of Science and Technology
PCB	Polychlorinated biphenyl
PCS	EPA Permit Compliance System
POTW	Publicly owned treatment works
PWS	Public water supply
QA	Quality assurance
QC	Quality control
RBP	Rapid bioassessment protocol
RF3	EPA Reach File Version 3
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SOP	Standard operating procedure
TDS	Total dissolved solids
TMDL	Total maximum daily load
UAA	Use attainability analysis
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VOC	Volatile organic compound
WBS	EPA Waterbody System
WQC	Water quality criteria
WET	Whole effluent toxicity
WLA	Wasteload allocation
WQL	Water quality limited
WQS	Water quality standard
WRC	Water Resource Council

SECTION 1

THE 305(b) PROCESS

1.1 Background

The Federal Water Pollution Control Act (PL92-500, commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987 (PL100-4), establishes a process for States to use to develop information on the quality of the Nation's water resources and to report this information to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the citizens of this country. The requirements for this process are found in Sections 106(e), 204(a), 303(d), 305(b), and 314(a) of the Clean Water Act (see Appendix A). Each State must develop a program to monitor the quality of its surface and ground waters and prepare a report every 2 years describing the status of its water quality. The EPA issues guidelines for States to use during each reporting cycle. States use these guidelines to prepare reports for EPA. EPA compiles the data from the State reports, summarizes them, and transmits the summaries to Congress along with an analysis of the status of water quality nationwide.

This process, referred to as the 305(b) process, is an essential aspect of the Nation's water pollution control effort. It is the principal means by which the EPA, Congress, and the public evaluate water quality, the progress made in maintaining and restoring water quality, and the extent of remaining problems. Many States rely on the 305(b) process for information needed to conduct program planning and to report to their legislatures on progress and remaining problems in their water pollution control programs. The 305(b) process is an integral part of the State water quality management program, requirements for which are set forth in 40 CFR 130. In 1994, 58 States, Territories, Interstate Commissions, and Indian Tribes prepared 305(b) reports.

1.2 Vision and Long-term Goals

The following are the vision and long-term goal statements for State 305(b) reports and the *National Water Quality Inventory Report to Congress*.

Vision for State 305(b) Reports and the *National Water Quality Inventory Reports to Congress*

The 305(b) reports will characterize water quality and the attainment of water quality standards at various geographic scales. In doing so, the State/Territory/Interstate and Tribal reports, as well as the *National Water Quality Inventory*, will

- Comprehensively characterize the waters of the States, Tribes, Territories, and the Nation, including surface water, ground water, coastal water, and wetlands
- Use data of known quality from multiple sources to make assessments
- Indicate progress toward meeting water quality standards and goals
- Describe causes of polluted waters and where and when waters need special protection
- Support watershed and environmental policy decisionmaking and resource allocation to address these needs
- Describe the effects of prevention and restoration programs as well as the associated costs and benefits
- In the long term, describe assessment trends and predict changes
- Initiate development of a comprehensive inventory of water quality that identifies the location and causes of polluted waters and that helps States, Tribes, and Territories direct control programs and implement management decisions.

Long-term Goals for the 305(b) Process

Purpose and Uses

- The Report to Congress continues to meet Clean Water Act (CWA) requirements and be a primary source of national information on water quality.
- The State and national 305(b) reports meet CWA reporting requirements, which include reporting on the achievement of water quality standards and designated uses, recommendations for actions to achieve these uses, and estimates of the environmental impact, costs, and benefits of achieving these uses.
- The assessment data that form the basis of the reports become more useful and accessible to decisionmakers by increased use of tools such as a modernized STORET, the EPA Waterbody System (WBS), the EPA Reach File Version 3 (RF3), and geographic information systems (GISs).
- The reports move toward reporting assessment data by watershed and/or hydrologic unit and State; data management tools allow consolidation at both levels.
- The reports also satisfy other needs identified by State 305(b) staff: educating citizens and elected officials, helping to focus resources on priority areas, consolidating assessments in one place, consolidating CWA-related lists of impaired waters, identifying data gaps, and reporting the results of comprehensive assessments.

Reporting Format and Content

- Report format and content remain relatively stable with some improvements each cycle, such as:
  - increased use of GIS maps
  - more emphasis on watershed protection, ecological indicators, and biological integrity
  - increased emphasis on Regional and Tribal water quality issues
  - increased input from sources outside 305(b) such as EPA's Environmental Monitoring and Assessment Program (EMAP), the Department of Interior's National Biological Service (NBS) and National Ambient Water Quality Assessment (NAWQA) Program, the National Oceanic and Atmospheric Administration's National Status and Trends Program, and the Intergovernmental Task Force on Monitoring Water Quality (ITFM).
- The full Report to Congress and/or the Summary Report become available in electronic format on the information superhighway; platforms may include the Internet or CD ROM.

(continued)

Long-term Goals (continued)

Time and Extent of Assessments

- The reports comprehensively characterize the condition of the waters of the States, Territories, Tribes, and the Nation in transitioning to a 5-year 305(b) cycle.
- States make greater use of data from Federal agencies, all appropriate State agencies, local governments, and nongovernmental organizations to increase the extent of State assessments each 305(b) cycle.
- Between 305(b) cycles, States keep their monitoring and assessment databases current to simplify report preparation and increase the usefulness of assessment data.

Assessment Quality

- States adopt improved monitoring and assessment methods as recommended by the ITFM and reported in the 305(b) reports.
- The reports include assessments of ground water aquifers.
- States increase efforts to achieve reproducible assessments; i.e., once an assessment methodology has been set, the use support determination for any waterbody becomes independent of the individual assessor.
- States identify the quality of individual assessments beginning with aquatic life use support for wadable streams and rivers in 1996. Also, States describe their assessment methods in detail and include flow charts of these methods.
- Assessments begin early in each cycle to allow time for adequate quality assurance of State reports and WBS or State-specific databases.
- States and EPA georeference State waterbodies to Reach File, Version 3 (RF3), to allow mapping of impaired waters.
- At the 305(b) Workgroup's recommendation, at least one staff position per State is devoted to managing and analyzing assessment data, with a dedicated personal computer and GIS support. The ITFM and EPA's 106 Guidelines recommend a multidisciplinary State assessment team.

1.3 Goals for the 1996 Cycle

EPA establishes goals or themes for each 305(b) reporting cycle to promote achievement of the vision and long-term goals for the 305(b) process and to coordinate reporting efforts among the States, Territories, Interstate Commissions, and Tribes. The goals for 1996 are to

- Expand use of biological indicators and reporting
- Improve technical basis and extent of assessments
- Document and improve assessment quality
- Increase the use of visuals in presenting information (e.g., GIS maps)
- Develop a process for reporting by hydrologic unit
- Improve data management.

The following discussion expands upon these goals for the 1996 cycle.

Expand Use of Biological Indicators and Reporting

EPA and the States have long recognized the importance of developing, implementing, and supporting ambient biological assessment programs to report on the overall health of the aquatic ecosystem. Biological indicators reveal whether an ecosystem is functioning properly and is self-sustaining. This information will assist States, Territories, Tribes, and Interstate Commissions in measuring progress toward achieving the CWA objective of biological integrity and determining attainment of designated aquatic life uses. EPA strongly recommends using an integrated assessment involving biological, physical/chemical, and toxicological monitoring.

The Intergovernmental Task Force on Monitoring Water Quality (ITFM), composed of representatives from 10 States, Tribes, or Interstate Commissions and 10 Federal agencies, is recommending methods for assessing water quality, including biological indicators. For additional information on indicators recommended by ITFM, see Sections 4.7 and 5.1.2 and *Water Quality Monitoring in the United States* (ITFM, 1994a).

EPA and the ITFM believe that increased capability and use of biological assessment tools at the State level will result in more consistent and accurate reporting of designated use attainment in the *National Water Quality Inventory Report to Congress*.

Improve Technical Basis and Extent of Assessments

In recent years, work groups have made substantial progress in improving the technical basis and consistency of water quality assessments. However, further progress is needed to increase the consistency and usefulness of water quality measures reported by the States and summarized in the *National Water Quality Inventory Report to Congress*.

EPA convened a 305(b) Consistency Workgroup in 1990, and expanded it in 1992 and 1994, to address issues of consistency in water quality reporting and to improve accuracy and coverage of State assessments. The Workgroup now consists of representatives from 25 States and Territories, 3 Indian Tribes or Tribal Groups, 1 Interstate Commission, 6 Federal agencies, the 10 EPA Regions, and EPA Headquarters. This standing Workgroup, which will also develop future 305(b) guidance, engaged in numerous conference calls and issue papers, met in October 1993 and in June and October 1994 to review various drafts of the Guidelines and specific issues, and made the following recommendations to improve 1996 305(b) guidance to the States:

- Refine the definitions and guidance concerning data quality, sources of impairment, frequency and duration of exposure to toxics, and aquatic life assessments and indicators.

- Revise the guidance for ground water and drinking water reporting.

In addition to these recommendations, EPA has established the following goals for the 1996 cycle and beyond:

- States progress toward characterizing all surface and ground waters every 5 years (after a transition period) using a variety of techniques targeted to the condition of, and goals for, the waters. These techniques may include probability-based sampling designs to enable inferences about entire categories of waters (e.g., all wadable streams) from a subset of waterbodies.

- States include information from Federal agencies and other relevant organizations in their 305(b) reports to increase the breadth or extent of assessments.

Guidance developed as a result of these recommendations is incorporated in Sections 5 and 7 and Appendix B. The Workgroup reviewed all changes, which are summarized in Section 2, "Summary of Changes for 1996." Of the bulleted items above, the third item may have the most significant impact on State 305(b) programs. Achieving a comprehensive level of assessments each 5 years could require new monitoring approaches and additional emphasis on assessments in some State water quality programs.

Document and Improve Assessment Quality

In the past, few States have tracked measures of assessment or data quality in their 305(b) assessments. For 1996, the Guidelines ask States to assign an Assessment Description Level to the aquatic life use support assessment for each wadable river or stream waterbody (see Section 5.1.4).

Such measures will be useful at the State level in planning and evaluating State monitoring programs. For example, a State might find that assessments in a particular basin need to have a higher level of information before spending large sums of money to implement controls there.

EPA will not aggregate assessment description information to the national level. Rather, EPA will use the information to determine the strengths and limitations of State monitoring and assessment programs and improvements needed (including appropriate funding), eventually helping to increase comparability of assessments among States. This is especially important, for example, in ecoregion studies that cross State boundaries or in Regional comparisons.

Increase the Use of Visuals in Presenting Information

A great deal of information about use support, causes, and sources can be presented in a single map or other illustration. Several States have made effective use of color maps and photographs in recent reports. GIS technology and the data to support it, such as WBS datasets, are becoming available in more State water quality agencies each 305(b) cycle. In FY94 and FY95, EPA is providing technical support to States to georeference their WBS waterbodies to the Reach File Version 3 (RF3) to facilitate GIS applications.

The goal for 1996 is for each State to include maps showing, at a minimum, use support, causes, and sources. Color maps are preferred because of the wide range of information they can present. EPA is making sample maps available to Regional 305(b) Coordinators.

Develop a Process for Reporting by Hydrologic Unit (Georeferencing)

Historically, States have tracked use support at two levels: the individual waterbody level and statewide. Modern information technology makes it possible to track assessments at other levels with relatively little additional effort. The most useful levels to water quality managers are the watershed, the river basin, the U.S. Geological Survey (USGS) 8-digit Cataloging Unit, and the ecoregion. Figure 1-1 shows three of these different levels; also, Appendix H contains examples of assessment information at the basin level.

The goal for 1996 is to move closer to full integration of assessment information at all scales. Fully integrated assessment information would mean

- All waterbodies are georeferenced (i.e., assigned locational coordinates).
- Watersheds, basins, and other hydrologic units are selected to "nest" within one another and to share common boundaries wherever possible.

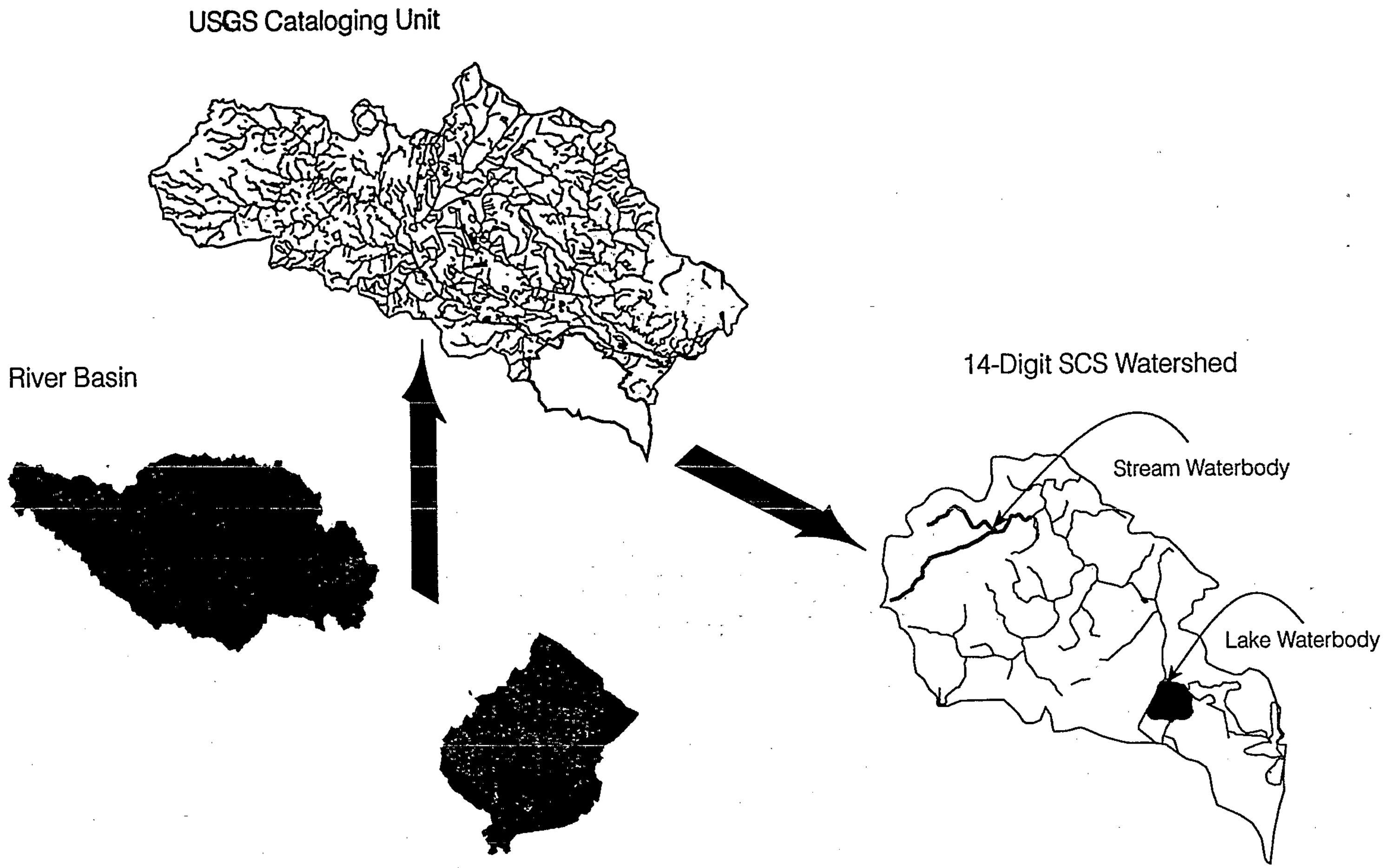


Figure 1-1. Hierarchy of nested watersheds (adapted from GIS coverages for the Upper Tar-Pamlico River Basin, NC; RTI, 1994)

- Assessment reports and maps can be generated at any hydrologic level and by ecoregion.

- Assessment results are consistent among 305(b) reports, watershed plans, basin plans, and other State reports.

Careful data integration is key to the goal of aggregating assessments at different hydrologic units. For this reason, EPA is providing technical support to the States for georeferencing waterbodies. Some States are revising their watershed boundaries to be consistent with other agencies' boundaries. As States upgrade their information systems and make greater use of GIS, WBS, and other tools, EPA is confident that this goal will eventually be achieved nationwide.

States with information systems that can generate assessments at the river basin or hydrologic unit level are asked to report their assessments for 1996 on this basis as well as to present statewide summary data. Please contact EPA's National 305(b) Coordinator, Barry Burgan, at (202) 260-7060, or your Regional 305(b) Coordinator for more information.

Improve Data Management

Information from the 305(b) process is becoming critically important as water pollution control efforts shift from technology-based to water-quality-based approaches. Waterbody-specific information is needed to comply with requirements under Sections 319, 314, and 303(d) of the Clean Water Act and to answer key programmatic questions. To improve data consistency and usefulness, simplify preparation of State reports, and provide a management tool for States, EPA developed a computerized data system, the Waterbody System (WBS), to manage the waterbody-specific portion of the 305(b) information.

In 1993–94, WBS users and EPA recommended the following for the 1996 cycle:

- Maintain stability in basic WBS operations

- Develop a local area network (LAN) version of WBS

- Continue progress on reach-indexing waterbodies to RF3

- Enhance the WBS Detailed Option for those States that want to use it to manage assessment data at the subwaterbody level

- Develop a distributed file approach for program-specific information (e.g., for Clean Lakes or total maximum daily load [TMDL] data) that plugs into the core WBS

- Provide additional hands-on WBS and RF3 training

- Introduce Assessment Description Codes as measures of quality in ALUS assessments

- Promote the establishment of a full-time position for water quality assessments and WBS use in each State and Region to maintain ongoing familiarity with WBS and provide adequate labor for ensuring data quality

- Continue to provide technical support to States that choose to use WBS. Work with other States to provide EPA with WBS-compatible data files sufficiently complete for EPA to aggregate.

EPA is implementing these recommendations for the 1996 cycle. The updated version of WBS, WBS96, will retain the same core programs and user-friendly concepts (pop-up windows, pick lists) as the previous version. EPA will provide WBS96 and installation instructions to States within a few weeks of transmittal of final 1996 *305(b) Guidelines*. EPA contacts for the WBS are the Regional WBS Coordinators and Jack Clifford, National WBS Coordinator, (202) 260-3667.

EPA expects States to fully implement the WBS or a WBS-compatible system for 1996. EPA has provided WBS users with technical assistance since 1987 and will continue to do so in 1995-96.

1.4 Tribal 305(b) Reporting

EPA encourages Native American Tribes to develop the capability to assess and report on the quality of Tribal water resources. The development of a Water Quality Assessment Report under Section 305(b) of the Clean Water Act provides a management tool that can be used by Tribal decisionmakers to protect the land and water for future generations. These reports provide a method for Tribal decisionmakers to assess monitoring data in a meaningful way and use this information to guide efforts to care for Tribal water resources. The process offers an opportunity for a Tribe to call national attention to issues such as fish tissue and groundwater contamination from toxic chemicals and provides a vehicle for recommending actions to EPA to achieve the objectives of the Clean Water Act and protect Tribal waters for cultural or ceremonial needs.

Native Americans are exempted from the Clean Water Act reporting requirement under Section 305(b) (*Federal Register*, Vol. 54, No. 68, April 11, 1989, p. 14357). However, several Tribal entities, including the Hoopa Valley Reservation in California and the Gila River Community in Arizona, have prepared 305(b) reports. This reporting process has allowed these Tribes to go beyond reporting summaries of raw data and to identify the pollutants and stressors causing impairment of Tribal waters and the sources of these stressors where possible.

These Guidelines contain a summary of key items for first-time Tribal reports (Appendix B). The process goes beyond the requirements to perform monitoring and/or analysis in accordance with EPA quality assurance and quality control (QA/QC) guidelines and provide summary monitoring data to EPA. Also, EPA has prepared a booklet describing the basics for Tribal 305(b) reporting and potential advantages to Tribes that choose to report through the 305(b) process (U.S. EPA, 1995a). This booklet is available through EPA Regional 305(b) Coordinators (see list inside front cover of these Guidelines).

EPA encourages Tribes to work with appropriate Federal or State agencies to facilitate technical transfer of methods and data to enhance the Tribes' capabilities and ensure coverage of Tribal waters. Tribes are encouraged to prepare their own 305(b) reports, prepare a joint report about Tribal waters with the appropriate State water quality agency, or contribute assessment data to the State 305(b) report.

SECTION 2

SUMMARY OF CHANGES FOR 1996

This section summarizes changes in the 1996 305(b) Guidelines since the 1994 Guidelines. The changes are grouped below by topic.

2.1 Vision and Goals

- New vision statement and goals for State 305(b) reports and the *National Water Quality Inventory Reports to Congress* (pp. 1-2 through 1-4)

2.2 Individual Use Support

- Expanded guidance for making aquatic life use support decisions including revised guidance on use of toxicant data (p. 5-1)
- New Assessment Description Codes as measures of assessment quality for aquatic life use support (ALUS) assessments of certain waterbodies (p. 5-5)
- Summary table on impaired waters replaces overall use support table (p. 7-8)
- Guidance on breadth or extent of assessment for surface waters (p. 4-1)
- Examples of level of detail requested in describing assessment methods (Appendix F)

2.3 Ground Water, Drinking Water, and Wetlands Resources

- New guidance for reporting drinking water use assessments to take advantage of Safe Drinking Water Act (SDWA) reporting requirements and to emphasize the range of SDWA contaminants (pp. 5-1 and 7-38)
- New guidance for reporting ground water assessments to emphasize reporting by aquifer or hydrologic setting for three types of monitoring data, based on work by the 305(b) Ground Water Subgroup (p. 8-1)
- Reduced wetlands assessment reporting requirements (p. 7-26)

2.4 Comprehensive and Targeted Coverage

- Transition to goal of characterizing all waters of the State according to condition of, and goals for, the waters, targeted to a 5-year cycle (p. 4-2)
- Goal of delineating and spatially referencing all waterbodies, with focus on impaired and threatened waterbodies (pp. 1-7 and 4-6)
- Reporting by river basin beginning in 1996 for States with the necessary data and data management capabilities (pp. 1-9, 4-12, and Appendix H)
- Special guidance for first-time Tribal 305(b) reports (Appendix B)

2.5 Better Definitions

- Clarified definitions of major, moderate, and minor causes and sources and natural sources (pp. 3-12 and 3-14)
- Types of information to better address sources of impairment (Appendix C)
- Clearer guidance on cost/benefit information (p. 6-9)

2.6 Format

- Guidelines reformatted to present a more logical flow of information about the 305(b) assessment process.
- Certain tables on public health/aquatic life concerns now optional in cases where EPA has national level data or where State-level data are not useful at the national level (p. 7-31)
- WBS being modified to reflect changes to the WBS (EPA will distribute WBS96 several weeks after these Guidelines)
- Emphasis on use of visuals such as maps for illustrating use attainment, causes, and sources (pp. 1-7 and 7-4)
- New format for reporting on surface water monitoring programs to be consistent with recent EPA Section 106 grant guidance and ITFM monitoring framework (p. 7-1, Appendix E)
- Sections dealing with water pollution control programs to appear near beginning of 305(b) report (p. 6-7)

SECTION 3

WATER QUALITY ASSESSMENTS UNDER SECTION 305(b)

This section describes the basic components of a water quality assessment including degree of use support, causes (pollutants and other stressors), and sources of impairment. It also gives clearer explanations of several concepts that may have caused inconsistencies in the past such as the fully supporting but threatened category, presumed assessments, and natural sources.

3.1 What Is an Assessment?

In setting their water quality standards, States assign one or more designated uses to each individual waterbody. Designated uses are beneficial uses that States want their waters to support. Examples are aquatic life support, fish consumption, swimming, and drinking water supply. Under Section 305(b), assessment of an individual waterbody (e.g., a stream segment or lake) means analyzing biological/habitat and physical/chemical data and other information to determine

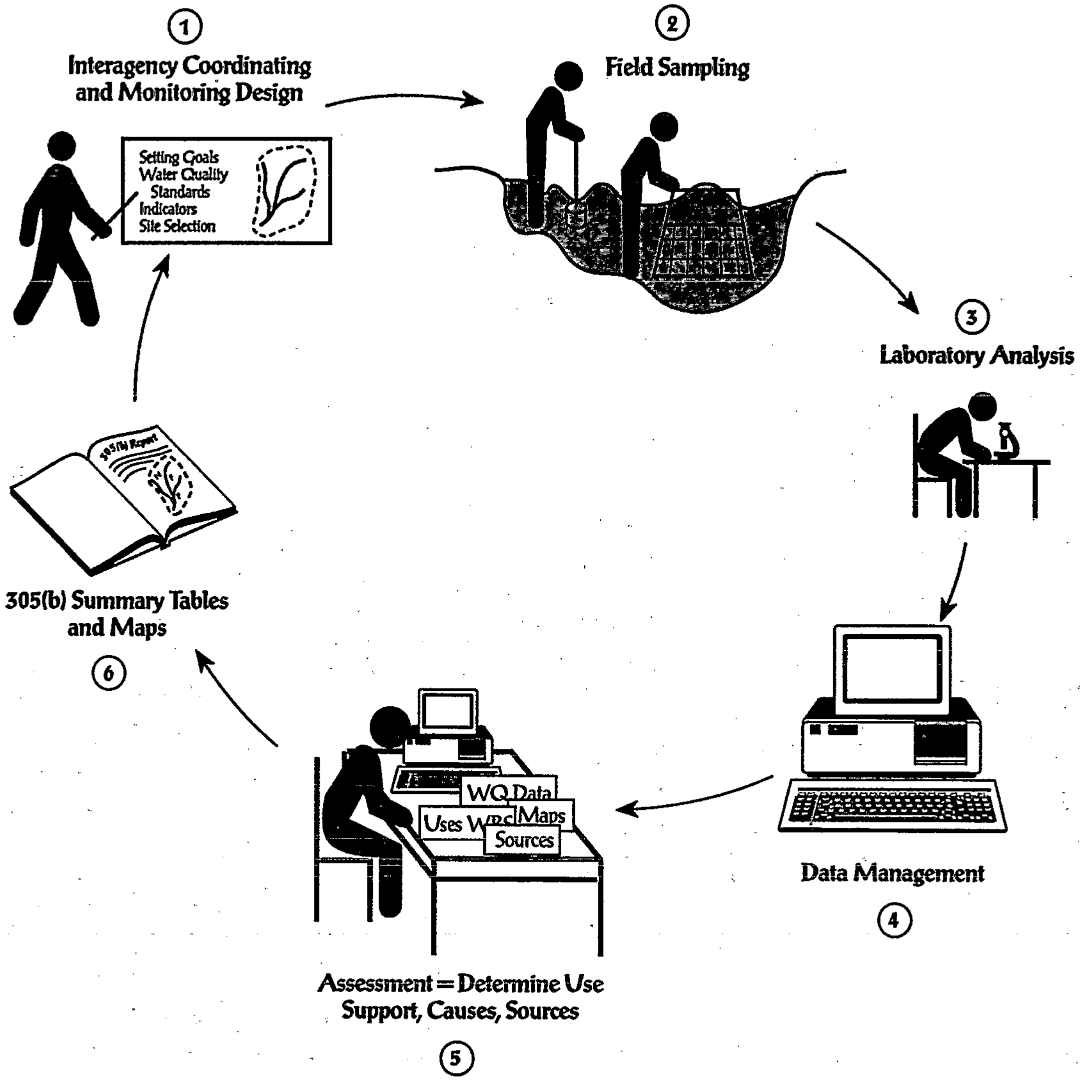
- The degree of designated use support of the waterbody (fully supporting, fully supporting but threatened, partially supporting, or not supporting)
- If designated uses are impaired, the causes (pollutants or stressors) and sources of the problem
- Biological integrity using State biological criteria or other measures.
- Descriptive information such as the type and level of data used in the assessment.

Figure 3-1 shows how monitoring, assessment, and reporting are related for an individual waterbody.

3.2 Degree of Use Support

Each designated use has its own requirements for a finding of fully supporting, fully supporting but threatened, partially supporting, or not supporting. **Section 5 of these Guidelines, "Making Use Support**

Figure 3-1. Monitoring, Assessment, and 305(b) Reporting as an Interrelated Process



Determinations," gives EPA's detailed recommendations for determining the degree of use support for various designated uses.

Throughout these Guidelines, the term "impairment" means either partially supporting or not supporting a designated use.

The category "fully supporting but threatened" requires further explanation. A waterbody is fully supporting but threatened for a particular designated use when it fully supports that use now but may not in the future unless pollution prevention or control action is taken because of anticipated sources or adverse pollution trends. Such waters are treated as a separate category from waters fully supporting uses. States should use this category to describe waters for which actual monitoring or evaluative data indicate an apparent declining water quality trend (i.e., water quality conditions have deteriorated, compared to earlier assessments, but the waters still support uses). States may also choose to include waters for which monitoring or evaluative data indicate potential water quality problems requiring additional data or verification.

Fully supporting but threatened is not appropriate during temporary impairment of designated uses (e.g., due to a construction project in a watershed). The threatened category may be appropriate prior to anticipated impairment, but while actual impairment is occurring, partial support or nonsupport should be reported.

Summarizing Assessment Results in the Report to Congress

Beginning with the 1994 Report to Congress, EPA is using the following descriptive terms in graphical presentations of degree of designated use support:

Good Water Quality	=	Fully Supporting or Fully Supporting but Threatened
Fair Water Quality	=	Partially Supporting
Poor Water Quality	=	Not Supporting
Impaired	=	Partially Supporting or Not Supporting

3.3 Types of Assessment Information

The State reports assessments of only those waterbodies for which use support decisions can be based on reliable water quality information. Such assessments are not limited to waters that have been directly monitored -- it is appropriate in many cases to make judgments based on other information. Waterbodies assessed prior to the current reporting period can be included in 305(b) reports if the State believes that the assessment conclusions are still valid. It is not appropriate, however, to claim that waterbodies are fully supporting uses by default in the absence of sufficient information to make an assessment (see also Section 3.5).

Table 3-1 lists categories of information for assessments. These Assessment Type Codes are from the EPA WBS. They provide a wealth of information about the basis for individual assessments. For the 1996 cycle and beyond, EPA is strongly encouraging the use of Assessment Type Codes in WBS and other State assessment data systems.

3.4 Monitored and Evaluated Waters

EPA asks the States to distinguish between assessments based on monitoring and assessments based on other information.

- "Evaluated waters" are those waterbodies for which the use support decision is based on information other than current site-specific ambient data, such as data on land use, location of sources, predictive modeling using estimated input variables, and some surveys of fish and game biologists. *As a general guide*, if an assessment is based on older ambient data (e.g., older than 5 years), the State should also consider it "evaluated."

- "Monitored waters" are those waterbodies for which the use support decision is principally based on current site-specific ambient data believed to accurately portray water quality conditions. Waters with data from biosurveys should be included in this category along with waters monitored by fixed-station chemical/physical monitoring. To be considered "monitored" based on fixed-station chemical/physical monitoring, waters should be sampled quarterly or more frequently

States may use some flexibility in applying these guidelines. For example:

- For the 800 series of codes in Table 3-1, if State-approved quality assurance/quality control procedures have been applied to volunteer monitoring programs, waters sampled under these programs could be considered monitored. However, a State may use its discretion in making an Assessment Category determination of evaluated vs. monitored.

- If older ambient data exist for high-quality waters located in remote areas with no known pollutant sources, and if those data are believed to accurately portray water quality conditions, those waters could be considered monitored.

EPA and States have been working together to better define the kinds of data upon which assessment decisions are made. See Tables 5-2 and 5-3, which describe how various kinds of data correspond to "monitored" and "evaluated."

Table 3-1. Assessment Type Codes from the Waterbody System

100	**Qualitative (evaluated) assessment--unspecified**[a]
110	Information from local residents
120	Surveys of fish and game biologists/other professionals
130	Land use information and location of sources
140	Incidence of spills, fish kills, or abnormalities
150	Monitoring data that are more than 5 years old (See 800 category)
175	Occurrence of conditions judged to cause impairment (e.g., channelization, dredging, severe bank erosion)
180	Screening models (desktop models; models are not calibrated or verified)
190	Biological/habitat data extrapolated from upstream or downstream waterbody
191	Physical/chemical data extrapolated from upstream or downstream waterbody
200	**Physical/chemical monitoring**[b]
210	Fixed-station physical/chemical monitoring, conventional pollutants only
211	Highest quality fixed-station physical/chemical monitoring, conventional pollutants; frequency and coverage sufficient to capture acute and chronic events, key periods, high and low flows
220	Non-fixed-station physical/chemical monitoring, conventional pollutants only
222	Non-fixed-station monitoring, conventional, during key seasons and flows
230	Fixed-station physical/chemical monitoring, conventional plus toxic pollutants
231	Highest quality fixed-station physical/chemical monitoring, conventional plus toxicants; frequency and coverage sufficient to capture acute and chronic events, key periods, high and low flows
240	Non-fixed-station physical/chemical monitoring, conventional plus toxic pollutants
242	Non-fixed-station physical/chemical monitoring, conventional plus toxicants, during key seasons and flows
250	Chemical monitoring of sediments
260	Fish tissue analysis
270	PWS chemical monitoring (ambient water)
275	PWS chemical monitoring (finished water)
300	**Biological monitoring**[b]
310	Ecological/habitat surveys
315	Regional reference site approach
320	Benthic macroinvertebrate surveys
321	RBP III or equivalent benthos surveys
322	RBP I or II or equivalent benthos surveys
330	Fish surveys
331	RBP V or equivalent fish surveys
340	Primary producer surveys (phytoplankton, periphyton, and/or macrophyton)
350	Fixed-station biological monitoring

Table 3-1 (continued)

400	**Pathogen monitoring**[b]
410	Shellfish surveys
420	Water column surveys (e.g., fecal coliform)
430	Sediment analysis
440	PWS pathogen monitoring (ambient water)
450	PWS pathogen monitoring (finished water)
500	**Toxicity testing**[b]
510	Effluent toxicity testing, acute
520	Effluent toxicity testing, chronic
530	Ambient toxicity testing, acute
540	Ambient toxicity testing, chronic
550	Toxicity testing of sediments
600	**Modeling**[c]
610	Calibrated models (calibration data are less than 5 years old)
700	**Integrated intensive survey**[b] (field work exceeds one 24-hour period and multiple media are sampled)
710	Combined sampling of water column, sediment, and biota for chemical analysis
720	Biosurveys of multiple taxonomic groups (e.g., fish, invertebrates, algae)
Assessments Based on Data from Other Sources	
800	**Assessments based on data from other sources**[c]
810	Chemical/physical monitoring data by quality-assured volunteer program
820	Benthic macroinvertebrate surveys by quality-assured volunteer program
830	Bacteriological water column sampling by quality-assured volunteer program
840	Discharger self-monitoring data (effluent)
850	Discharger self-monitoring data (ambient)
860	Monitoring data collected by other agencies or organizations (use the assessment comment field to list other agencies)
870	Drinking water supply closures or advisories (source-water quality based)

Table 3-1 (continued)

Discrepancy in Aquatic Life Assessment Results[d]

900	**Discrepancy in Aquatic Life Assessment Results**
910	Discrepancy among different data types; aquatic life assessment is based on physical/chemical data
920	Discrepancy among different data types; aquatic life assessment is based on biological/habitat data
930	Discrepancy among different data types; aquatic life assessment is based on toxicity testing data
940	Discrepancy among different data types; aquatic life assessment is based on qualitative (evaluated) assessment data

[Note: New codes have been added to include information types in Tables 5-2 and 5-3.]

[a] Generally considered to be evaluated assessment types.

[b] Generally considered to be monitored assessment types.

[c] Considered to be monitored or evaluated assessment types depending on data quality and State assessment protocols.

[d] States are requested to use these codes to identify cases when biological/habitat and physical/chemical data show different assessment results.

3.5 Presumed Assessments

EPA cautions States against "presumed assessments" wherein assessment results are extrapolated without adequate technical basis. Examples of presumed assessments are

- Assuming that waterbodies are fully supporting by default unless there is information to the contrary.
- Extrapolating assessments from one waterbody or watershed to others not having very similar characteristics.
- Extrapolating the "percentage of assessed stream miles that are fully supporting" to all streams in the State.

EPA does encourage States to report on all waters for which there is a reasonable technical basis for evaluation. A reasonable basis could include a judgment that a stream is not supporting uses based on channelization, a highly disturbed watershed, and data from nearby streams with similar characteristics. However, EPA recognizes that States will have "unassessed" waters in the 1996 cycle as they make progress toward characterizing all waters every 5 years.

In addition, EPA recommends that data from a single monitoring station not be used to generate a monitored assessment of an entire watershed. Rather, a monitoring station can be considered representative of a waterbody for that distance upstream and/or downstream in which there are no significant influences to the waterbody that might tend to change water quality within the zone represented by the monitoring station. See Section 4.1.

3.6 Causes of Impairment (Pollutants and Other Stressors)

Causes are those pollutants and other stressors that contribute to the actual or threatened impairment of designated uses in a waterbody. Table 3-2 lists cause codes from the WBS. States can also add their own codes to WBS to track additional causes. For example, some States have added codes under Code 500--Metals to track specific metals such as mercury and copper.

3.7 Sources of Impairment

Sources are the activities, facilities, or conditions that contribute pollutants or stressors resulting in impairment of designated uses in a waterbody. Table 3-3 lists source codes from the WBS. States can also add their own source codes to the WBS.

Table 3-2. Cause Codes from the Waterbody System

0000	Cause Unknown
0100	Unknown Toxicity
0200	Pesticides
0300	Priority Organics
0400	Nonpriority Organics
0500	Metals
0600	Ammonia (un-ionized)
0700	Chlorine
0800	Other Inorganics
0900	Nutrients
1000	pH
1100	Siltation
1200	Organic Enrichment\Low Dissolved Oxygen
1300	Salinity/Total Dissolved Solids/Chlorides/Sulfates
1400	Thermal Modifications
1400	Flow Alterations
1600	Habitat Alterations (other than flow)
1700	Pathogens
1800	Radiation
1900	Oil and Grease
2000	Taste and Odor
2100	Suspended Solids
2200	Noxious Aquatic Plants
2400	Total Toxics
2500	Turbidity
2600	Exotic Species

NOTES: In addition to the above, WBS users can enter their own customized cause codes. See WBS Users Guide.

Codes 0200 through 0800 are toxicants for purposes of WBS reports.

Filling and draining is considered a source (Source Code 7800) and no longer appears in the above table.

WBS Users--If a State chooses to add cause codes to WBS, the data system can still be used to generate the 305(b) summary report, "Total Sizes of Waters Impaired by Various Cause Categories." *To use the WBS to generate this table, enter a total size for each major category of causes (e.g., 0500--Metals or 0200--Pesticides) for each waterbody.* This is necessary because there may be overlap among the subcategories of causes. See "WBS Users" box following Table 7-5 for details.

Table 3-3. Source Codes from the Waterbody System

0100	**Industrial Point Sources**
0110	Major Industrial Point Sources
0120	Minor Industrial Point Sources
0200	**Municipal Point Sources**
0210	Major Municipal Point Sources
0220	Minor Municipal Point Sources
0230	Package Plants (Small Flows)
0400	**Combined Sewer Overflow**
0900	**Domestic Wastewater Lagoon**
1000	Agriculture
1100	Nonirrigated Crop Production
1200	Irrigated Crop Production
1300	Specialty Crop Production (e.g., horticulture, citrus, nuts, fruits)
1400	Pastureland
1500	Rangeland
1510	Riparian Grazing*
1520	Upland Grazing*
1600	Animal Operations*
1620	Concentrated Animal Feeding Operations (permitted, point source)*
1640	Confined Animal Feeding Operations (NPS)*
1700	Aquaculture
1800	Off-farm Animal Holding/Management Area*
1900	Manure Lagoons
2000	Silviculture
2100	Harvesting, Restoration, Residue Management
2200	Forest Management (e.g., pumped drainage, fertilization, pesticide application)*
2300	Logging Road Construction/Maintenance
2400	Silvicultural Point Sources
3000	Construction
3100	Highway/Road/Bridge Construction
3200	Land Development
4000	**Urban Runoff/Storm Sewers**
4100	Nonindustrial Permitted
4200	Industrial Permitted
4300	Other Urban Runoff
5000	**Resource Extraction**
5100	Surface Mining
5200	Subsurface Mining

Table 3-3 (continued)

5300	Placer Mining
5400	Dredge Mining
5500	Petroleum Activities
5600	Mill Tailings
5700	Mine Tailings
5800	Acid Mine Drainage
6000	**Land Disposal**
6100	Sludge
6200	Wastewater
6300	Landfills
6400	Industrial Land Treatment
6500	Onsite Wastewater Systems (Septic Tanks)
6600	Hazardous Waste
6700	Septage Disposal
7000	**Hydromodification**
7100	Channelization
7200	Dredging
7300	Dam Construction
7350	Upstream Impoundment
7400	Flow Regulations/Modification
7550	**Habitat Modification (other than Hydromod)***
7600	Removal of Riparian Vegetation
7700	Streambank Modification/Destabilization
7800	Drainage/Filling of Wetlands
7900	**Marinas**
8100	**Atmospheric Deposition**
8200	Waste Storage/Storage Tank Leaks
8300	Highway Maintenance and Runoff
8400	Spills
8500	**Contaminated Sediments**
8600	**Natural Sources**
8700	Recreational Activities
8900	Salt Storage Sites
8910	Groundwater Loadings
8920	Groundwater Withdrawal
8950	Other*
9000	**Unknown Source**

Notes: In addition to the above, WBS users can enter their own customized source codes. The overall code 8000 for "Other" has been deleted because it resulted in significant loss of detail nationwide.

*Codes changed or added since 1994 Guidelines.

WBS Users--WBS can be used to generate the 305(b) summary report, "Total Sizes of Waters Impaired by Various Source Categories." *However, to use the WBS to generate this table, enter a total size for each major category of sources (i.e,, the bold categories in Table 3-3 such as 1000--Agriculture and 2000--Silviculture).* This is necessary because there may be overlap among the subcategories of sources. See "WBS Users' box following Table 7-6 for details.

Determining the sources of designated use impairment can be a difficult process. Ambient monitoring data can give good evidence of the causes of impairment. In some cases, field observations can provide information on obvious, nearby problems; e.g., land use, substrate, and habitat may provide a basis for identifying sources. This is especially the case for "hydromodification" sources.

In most cases, additional information is needed--watershed land use inventories, records of permit compliance, areas with highly erodible soils, areas with poor best management practice (BMP) implementation, measurements of in-place contaminants, or loadings from atmospheric transport or ground water.

A modeling framework can be helpful, especially where a variety of sources could be involved. Even a simple annual average export-coefficient screening model can help determine if particular source categories are significant contributors to impairment. A well-rounded assessment process, therefore, might involve monitoring, an inventory of land uses and point source contributions for a watershed, and, where appropriate, a screening-level model to rank and prioritize the relative impacts of different source categories.

Appendix C lists types of information that can be used to determine sources of water quality impairment.

Natural Sources

The Natural Sources category should be reserved for waterbodies impaired due to naturally occurring conditions (i.e., not caused by, or otherwise related to, past or present human activity) or due to catastrophic conditions. In the past, some States have used natural sources as a catch-all category for unknown sources. This tends to give an inaccurate picture of the extent of natural sources at both State and national levels. States should use the natural sources category only for clearly defined cases, including:

- Saline water due to natural mineral salt deposits
- Metals due to naturally occurring deposits
- Low dissolved oxygen (DO) or pH caused by poor aeration or natural organic materials, where no human-related sources are present or where impairment would occur even in the absence of human activity
- Excessive siltation due to glacial till or turbidity due to glacial flour, where such siltation is not caused by human activity or where impairment would occur even in the absence of human activity
- Habitat loss or pollutant loads due to catastrophic floods that are excluded from water quality standards or other regulations
- High temperature, low DO, or high concentrations of pollutants due to catastrophic droughts with flows less than design flows in water quality standards.

The Natural Sources category does not include, for example, low flows due to diversions resulting in low DO; drainage from abandoned mines resulting in low pH; stormwater runoff resulting in habitat destruction, high temperatures, or other impacts except under catastrophic conditions; or atmospheric deposition of heavy metals where human-induced emissions are a factor.

For technical or economic reasons, impairment by a natural source may be beyond a State's capability to correct. A use attainability analysis (UAA) should be done to determine if designated uses are attainable or if other uses are more appropriate for a waterbody. Regional Water Quality Standards Coordinators can provide information on conducting UAAs. In the absence of a UAA, EPA recognizes that States may need to report impairment due to natural sources even in cases where standards could be overly restrictive or in need of revision.

3.8 Cause/Source Linkage

States are asked to link causes with sources for waterbodies in their assessment databases whenever possible. A special cause/source link field is provided in WBS for this purpose. Linked cause/source data are very important for producing the standard 305(b) report tables and for answering State resource management questions. For example, the question "Which waterbodies are impaired due to nutrients from agricultural runoff?" cannot be answered if the cause/source link is not used.

The following chart illustrates what happens when causes and sources are not linked. Although valuable information is stored, one cannot tell which sources are associated with which pollutants or stressors:

Causes and Sources Not Linked

Waterbody	Causes (pollutants/stressors)	Sources (not linked with causes)
WBID = XX-012 Mill Creek above Brook Branch	Nutrients, siltation, thermal modification	Urban runoff, removal of riparian vegetation, municipal point sources

The following chart shows how the same causes and sources can be associated with each other using the WBS link variable:

Causes and Sources Linked

Waterbody	Causes (pollutants/stressors)	Sources (linked with causes)
WBID = XX-012 Mill Creek above Brook Branch	Nutrients	Urban runoff
	Nutrients	Municipal point sources
	Siltation	Removal of riparian vegetation
	Thermal modification	Urban runoff
	Thermal modification	Removal of riparian vegetation

WBS users should link causes with sources for a waterbody whenever possible. This is especially important for 303(d) and 314 reporting. WBS contains a special cause/source link field for this purpose. Linked cause/source data are very important for answering management questions from State WBS users. For example, the question "Which waterbodies are not supporting uses due to nutrients from agricultural runoff?" cannot be answered if the cause/source link field is not used. Currently, causes and sources cannot be linked to individual designated uses in WBS. Few States have the extensive data needed to link these to specific uses; however, EPA will assist individual States that want to use the WBS detailed option for this purpose.

3.9 Major/Moderate/Minor Contribution to Impairment

Section 7 of these Guidelines (Tables 7-5 and 7-6) requests determination of the relative contribution to impairment of causes and sources of pollution.

The definitions of major/moderate/minor contributions are changed from the 1994 Guidelines to reflect the severity of impairment rather than the number of sources contributing.. The 1994 definitions, for example, required that a source be labeled "major" if it is the only source of impairment on a waterbody, regardless of the severity of impairment. The new definitions are:

- Major contribution: A cause/source makes a major contribution to impairment if it is the only one responsible for *nonsupport* of any designated use or it predominates over other causes/sources.

- Moderate contribution: A cause/source is the only one responsible for partial support of any use, predominates over other causes/sources of partial support, or is one of multiple causes/sources of nonsupport that have a significant impact on designated use attainment.

- Minor contribution: A cause/source is one of multiple causes/sources responsible for nonsupport or partial support and is judged to contribute relatively little to this nonattainment.

The major/moderate/minor designations are difficult to quantify and will continue to reflect the best professional judgment of the data analyst. For example, multiple minor causes/sources or multiple moderate causes/sources could be interpreted to add up to nonsupport.

SECTION 4

DESIGNING ASSESSMENTS AND MANAGING INFORMATION

This section discusses several topics related to the overall operation of State water quality assessment programs:

- Spatial issues such as the extent of individual assessments, the goal of comprehensively characterizing waters of the State, and delineating waterbodies and watersheds
- Target of a 5-year cycle for 305(b) reports
- Managing assessment data
- Conditions for valid and comparable assessments
- Recommendations of the Intergovernmental Task Force on Monitoring Water Quality (ITFM) as it relates to the future of 305(b) reporting.

4.1 Extent of Individual Assessments

The extent or size of a waterbody that is represented by a given monitoring station is important because it affects the quality of assessment results. For example, low assessment quality can result when a large segment of stream or a large lake is assessed based on a single monitoring site. The 305(b) Consistency Workgroup discussed this topic in 1994 and concluded that only general guidance can be given at this time, as follows.

A monitoring station can be considered representative of a stream waterbody for a distance upstream and downstream that has no significant influences that might tend to change water quality or habitat quality. A significant influence can be

- A point or nonpoint source input to the waterbody or its tributaries
- A change in watershed characteristics such as land use
- A change in riparian vegetation, stream banks, substrate, slope, or channel morphology

- A large tributary or diversion
- A hydrologic modification such as channelization or a dam.

Because of the importance of site-specific considerations, EPA discourages the use of uniform default values for the size of waterbody represented by a single monitoring site. For streams, States should consider the upstream and downstream characteristics of each monitoring station and its watershed in arriving at an extent of assessment. A single site should not be used to assess an entire watershed unless land use, sources, and habitat are relatively homogeneous (e.g., as is sometimes the case in undeveloped areas) and the observed stressor is consistent with watershed-wide impacts.

In general, a wadable stream station probably should represent no more than 5 to 10 miles of stream. For large rivers, EPA believes that 25 miles is a reasonable upper limit for a single station unless stream-specific data demonstrate otherwise. However, some large western rivers may have no significant influences for more than 25 miles, as is the case in New Mexico, where a few stations on large rivers are believed to represent 50 to 75 miles each.

For lakes, the factors that affect the number of monitoring sites needed per lake are complex. They include purpose of the sampling, lake size, stratification, morphometry, flow regime, and tributaries. No simple guideline for size assessed per station can be given. Reckhow and Chapra (1983) discuss monitoring design for lakes and the potential problems associated with sampling only a single site. Similarly, no specific guidelines are available for the extent of assessment of estuarine monitoring sites. The Washington Department of Ecology (DOE) is using a GIS to draw circles around each monitoring site; the site is considered to represent the area within its circle. Open water stations represent an area within a 4-mile radius, most bay stations represent an area within a 2-mile radius, and highly sheltered bay sites represent an area within a 0.5-mile radius. DOE uses circles in part to emphasize the uncertainty associated with the extent of assessment for estuarine sites.

For 1996, EPA asks States to provide information on how they determine extent of waterbody represented by a single assessment or monitoring site (see Section 7, Chapter 2, Assessment Methodology).

4.2 Comprehensive Statewide Assessment

EPA is moving toward a goal of **comprehensively characterizing waters** of the State every 5 years using a variety of monitoring techniques targeted to the condition of, and goals for, the waters. This would represent a significant increase in the percentage of waters assessed throughout the Nation. For example, in their 1992 305(b) reports, the States assessed 18 percent of the Nation's total stream miles (including intermittent streams, canals, and ditches), or less than half of the Nation's perennial stream miles. Achieving the goal of comprehensive coverage will require a combination of monitoring approaches including both targeted and probability-based monitoring and other techniques as well as aggregation of acceptable data from a variety of agencies and sources. Figure 4-1 shows several aspects of monitoring, assessment, and reporting that will be important to realizing the goal.

EPA is also beginning to develop, with State participation, an approach for a comprehensive water quality inventory of the condition of all assessed waterbodies. This inventory will include a subset of all impaired or threatened waters under Sections 303(d), 314(a), 319(a), and others. The comprehensive inventory will serve as data on water quality and will provide information needed by States to fulfill a number of reporting and assessment requirements under the CWA such as 305(b) and 303(d) reporting. See the "Reporting and Action" box in Figure 4-1.

Targeted Monitoring

In the past, much of State water quality monitoring has been at sites selected because the waterbody was of particular interest. This interest may be for a variety of reasons, e.g., impaired waterbodies, pristine or threatened waterbodies, or simply waterbodies of significant public interest. The selection of waterbodies on this basis is known as purposive selection; the data are intended to represent only the site itself and usually do not apply to other waterbodies or extrapolate beyond that site. The process for selecting and prioritizing waterbodies in this manner is critical because these are often the waterbodies of most interest to the public and/or most in need of management attention.

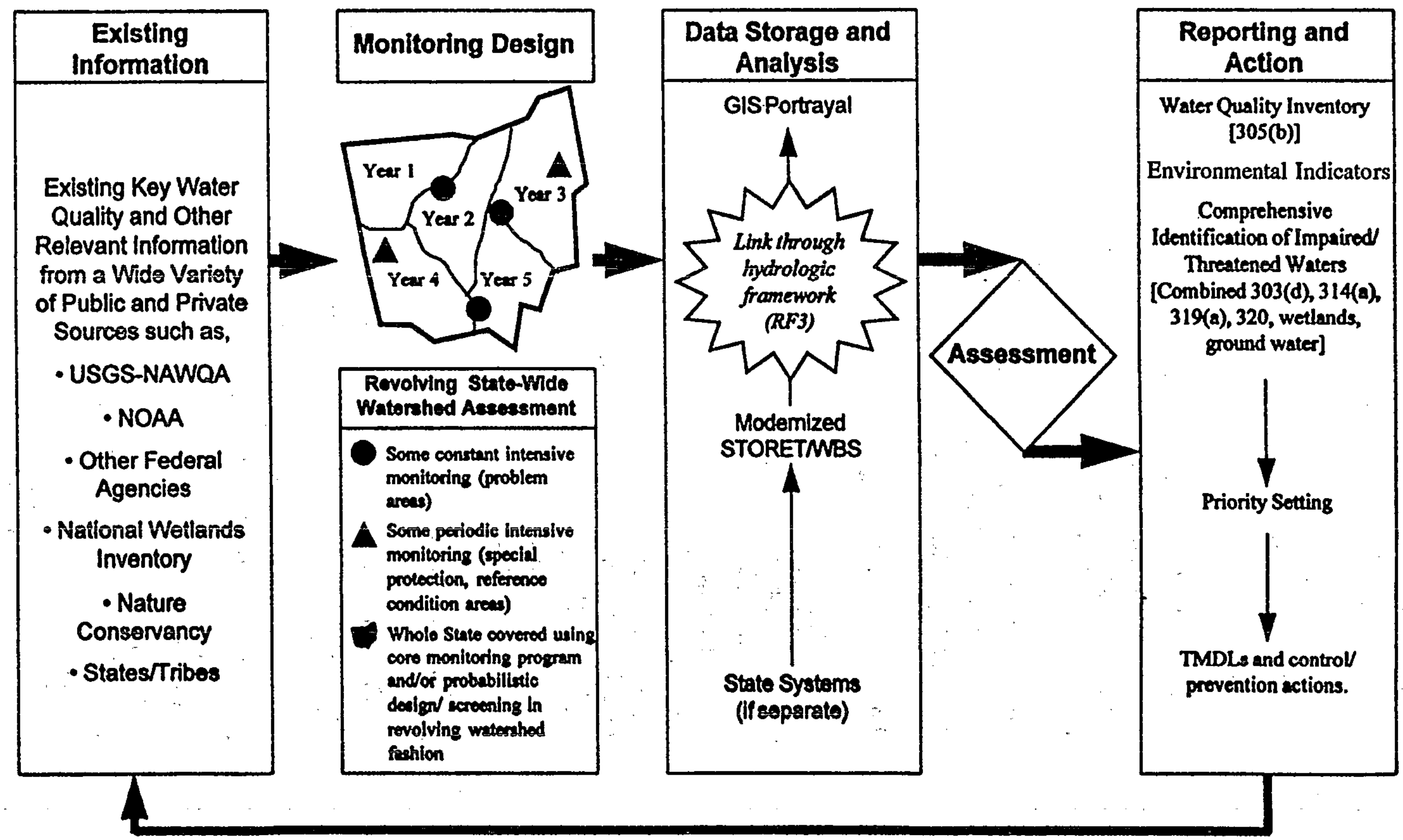
Probability-based Monitoring

Probability-based monitoring can provide a useful mechanism to fill information gaps for waterbodies that are not currently monitored by the State or Tribe or other agencies. Such an approach can be particularly useful when attempting to describe environmental conditions over large areas. A probability-based approach may be used to make a statement about all waterbodies of a particular class within an area (e.g., all lakes above 10 acres in the State) and to describe the level of uncertainty associated with the statement. Waterbodies are selected with a random or stratified random process so one can make inferences about all waterbodies in that class based on the few selected. The most likely use in many States will be to characterize the condition of all stream miles in the State or in smaller units such as ecoregions or large watersheds based on rotating basin surveys and core monitoring of a selected group of parameters. In using this approach, the result is an estimate about all waterbodies in that class meeting their use

Figure 4-1. Comprehensive State-Wide Water Assessment

Vision: *Comprehensive State assessment of water quality at various geographic scales. Reporting of the information to foster risk-based management decisions and inform Congress and the public.*

Major Opportunities for Realizing the Vision: ITFM, 106/604(b) guidelines, 305(b) guidelines, 303(d) regulations/guidance, State/EPA workgroups



with an identified range of uncertainty, e.g., "20% of stream miles ± 3% are fully supporting aquatic life use."

Considerable planning is required to define the particular classes of waterbodies of interest, but the end result can be a cost-effective, defensible and rigorous process for making inferences about all waterbodies in an area. The obvious limitation of probability-based monitoring is the lack of waterbody-specific information for those waterbodies that are not randomly selected. Waterbody-specific information is often needed to support water quality management objectives. Also, the results of probability-based monitoring may not be detailed enough to take specific actions at a site or waterbody. Delaware and Maryland have statewide probability-based networks. EPA will consider their methodologies and results when developing future technical guidance on probability-based monitoring. EPA plans to involve a workgroup in developing future 305(b) Guidelines, and the Workgroup will consider this topic.

In making a transition from the current 305(b) process to a process that characterizes waters more comprehensively using multiple monitoring techniques, special consideration will be needed in documenting the selection process. The 1996 Guidelines request more detailed descriptions of monitoring programs and how their data are used in assessments and in preparing the 305(b) summary tables. The types of information requested about monitoring design are listed at the beginning of Section 7 of these Guidelines; some of this information can be taken directly from State 106 workplans.

As described above, meeting the full range of State monitoring needs will require a multiyear State strategy that includes aggregation of data from a variety of sources and the use of various monitoring techniques such as probability-based surveys as well as high-priority, targeted sites. A legitimate question is how both probability-based and targeted information can be used together effectively. To date, there is no satisfactory solution to aggregating all of the information into a single statement. However, the two types of data can be used together to more fully describe our understanding of water quality conditions. For example, a probability data set might allow a State to conclude that 25 percent of all stream miles in the State do not support aquatic life use. The information from the targeted sites might suggest that 10 percent of the high-priority waterbodies do not support aquatic life use. One conclusion for this case might be that the State now should look for solutions to the problems outside of the high-priority systems. As another example, suppose one conclusion of the probability surveys was that 25 percent of stream miles do not support aquatic life use, but 50 percent of the high-priority sites do not support aquatic life use; in this case, one might conclude that there is a need for continued concern about these high-priority waterbodies and greater efforts to improve them.

4.3 Watershed and Waterbody Delineation

The waterbody is the basic unit-of-record for water quality assessment information. That is, most States assess individual waterbodies and store assessment results at this level--results such as degree of use support, causes, sources, and type of monitoring. The States have defined waterbodies in various ways, from short stream segments and individual lakes to entire watersheds.

The delineation of individual waterbodies is time-consuming but critically important to a State's 305(b) program. Many States have found it necessary to redelineate waterbodies after only a few years based on previously unrecognized data needs. The paragraphs below describe features of watersheds and waterbodies and common approaches to their delineation. One goal of this section is to help States make the best decisions about watershed and waterbody delineation, thereby avoiding their need to repeat the process later. Another goal is to ensure that whatever process is selected, it will result in data that can be related to standard watersheds such as USGS Cataloging Units or Natural Resources Conservation Service (NRCS; formerly the Soil Conservation Service, SCS) watersheds to allow data aggregation at various scales.

USGS Hydrologic Units

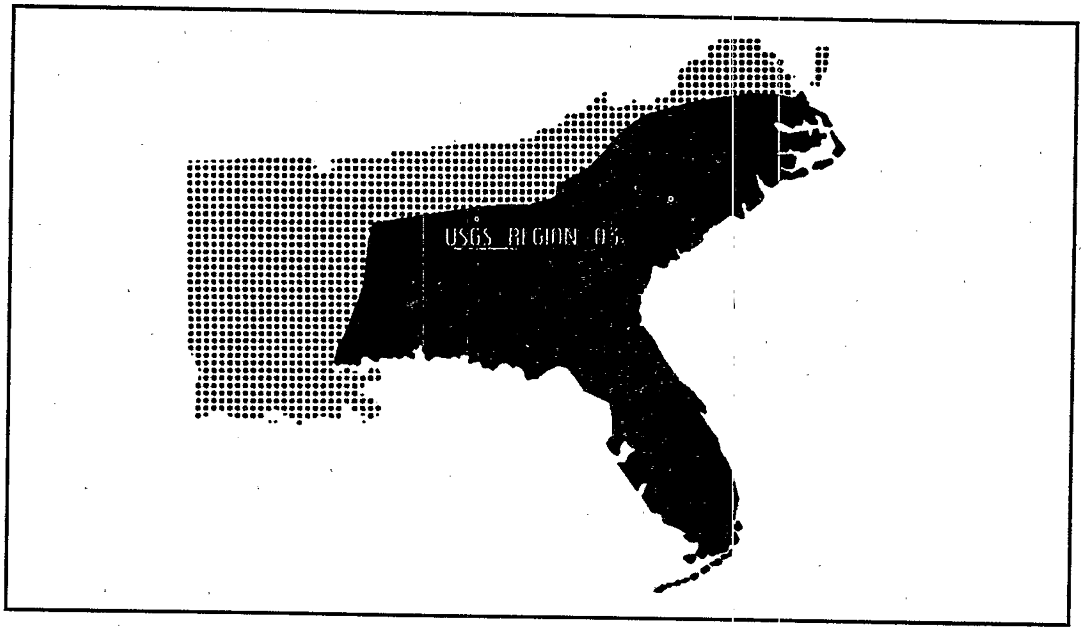
The Hydrologic Unit Code (HUC) is an eight-digit number that describes the four levels of hydrologic units into which the United States has been divided for purposes of water resources planning and data management:

- Region (2-digit codes)
- Subregion (4-digit codes)
- Accounting Unit (6-digit codes)
- Cataloging Unit (8-digit HUCs)

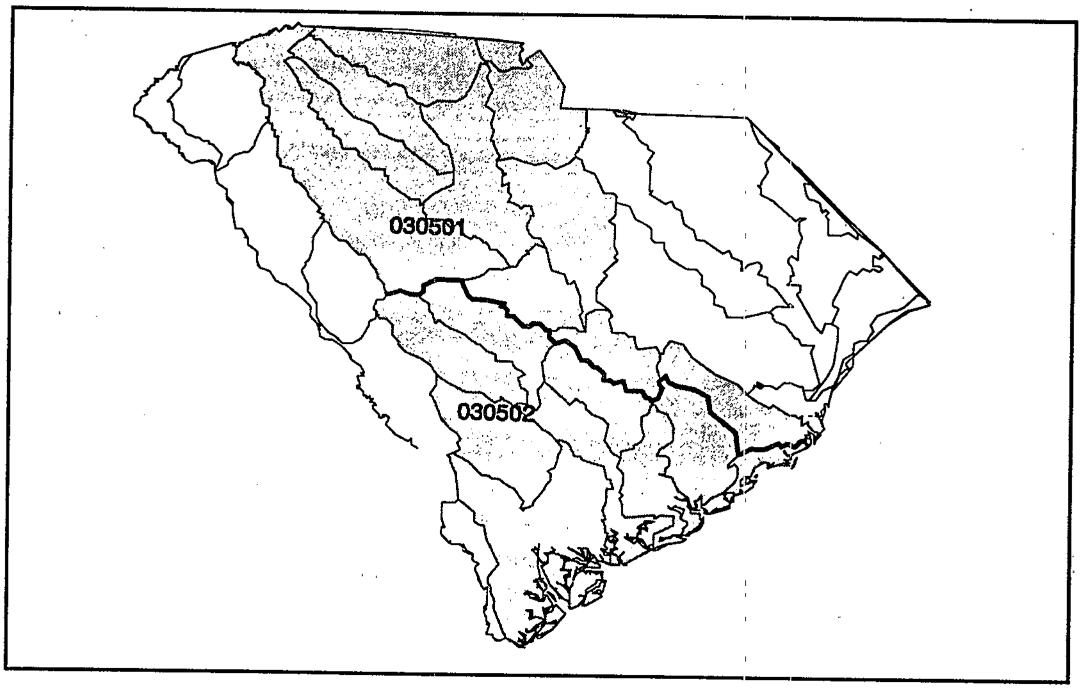
Note: NRCS/SCS has added two additional levels of watersheds (see page 4-8).

The following illustrations show how the hydrologic unit classification is applied to a portion of the State of South Carolina.

South Atlantic - Gulf Region 03



Regions - The Region is the largest unit that USGS uses for comprehensive planning. For example, the South Atlantic-Gulf Region 03 extends from the coastline to the Blue Ridge, and from southern Virginia through the Southeast to New Orleans, Louisiana. There are 18 regions in the coterminous United States, with a national total of 21 (including Alaska, Hawaii, and Puerto Rico and the Virgin Islands).



Subregions and Accounting Units - Subregions are defined by major river basins. For instance, in South Carolina, subregion 0305 includes the Saluda, Broad, and Santee Rivers and the Edisto system. Accounting Units are aggregations of Cataloging Units used by USGS to organize water resource data into manageable units. The South Carolina data in Subregion 0305 are organized into 030501--the Santee, Saluda, Broad Rivers accounting unit--and 030502--the Edisto River accounting unit.

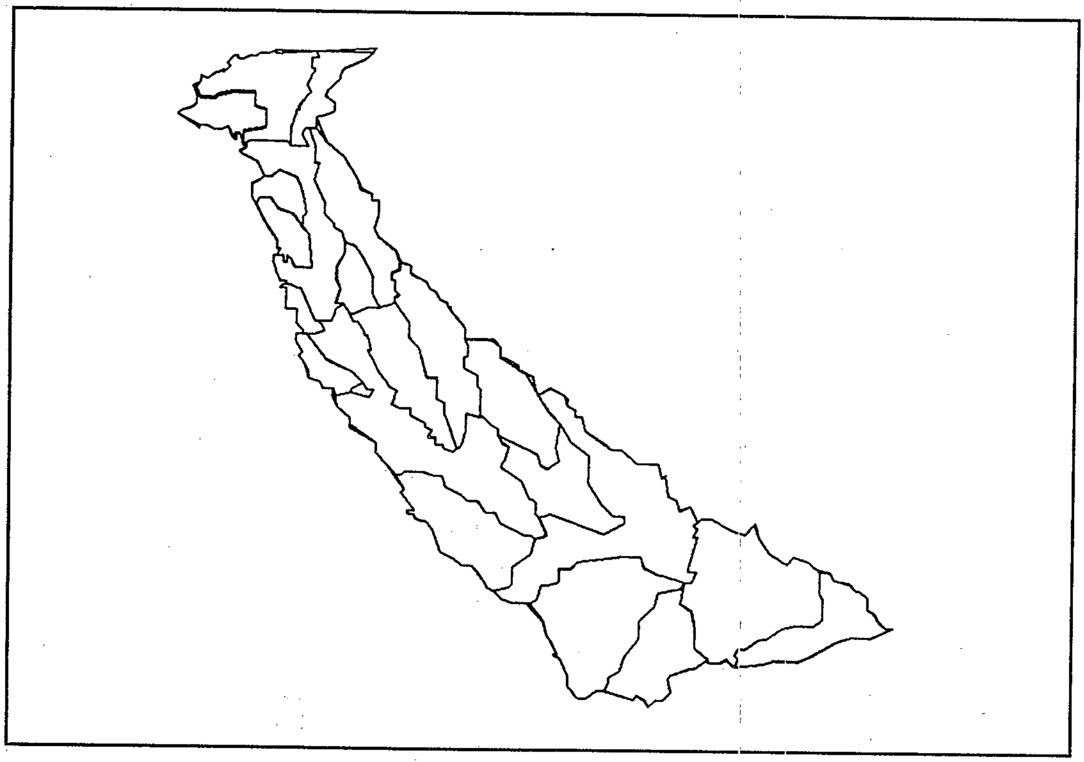
Cataloging Units (CUs) - The CU is the lowest level of hydrologic classifications by USGS for planning and data management. Nationally, there are approximately 3,500 CUs. The 8-digit HUC designates each individual CU. In the previous graphic, the lines within Accounting Unit 030501 are CU boundaries and each CU has a unique 8-digit HUC. The HUC has been adopted as a Federal Information Processing Standard (FIPS); i.e., the HUC is a mandatory standard for Federal agencies describing hydrologic data. The HUC classification is well accepted by professional planners and hydrologists at all levels of government and in the private sector.

SCS Watersheds

Years ago, the Soil Conservation Service (now the Natural Resources Conservation Service) subdivided the CUs into watersheds, appending three digits to the eight digit HUC (CU+3). The designations were made by each State Conservationist to create smaller units for planning activities. SCS had a consistency problem with the earlier designations, with inharmonious sizes from State to State and a lack of common standards for base maps. Now NRCS Headquarters is aggressively pursuing better coherence in the nationwide delineation. They are also proposing a Memorandum of Understanding with EPA and USGS to standardize use of the 11-digit watershed code. NRCS is also beginning to subdivide States into 14-digit small watersheds (CU+3+3) for planning and analysis at an even finer scale. For example, SCS in North Carolina worked closely with State environmental agencies to delineate 1,640 14-digit watersheds averaging about 19,000 acres each (see Figure 4-2).

Note: The SCS/NRCS watersheds are still commonly known as SCS watersheds, and this convention is followed in these Guidelines.

SCS 11-Digit Watersheds (South Carolina Waterbodies) in Cataloging Unit 03050109



South Carolina has defined its waterbodies as SCS watersheds (the 11-digit variety). Actually, the State's waterbodies comprise those streams or lakes that fall within the SCS watershed boundary. As indicated below, this method of waterbody delineation has both positive and negative implications.

SCS Watersheds as a Common Watershed Base

Many States are seeking to establish common watersheds for use by all State agencies, an approach EPA endorses. The watershed level that seems to offer the most advantages, and is the most frequently chosen by the States, is the SCS watershed. Use of these watershed boundaries allows easy access to SCS/NRCS data and improves coordination of nonpoint source assessments with other agencies.

South Carolina was the first State to index its waterbodies to RF3 and it used the SCS watershed as the basis for waterbody designation. At first, use support, cause, and source information was tracked only at the watershed level, but this proved too generalized for practical use. The State then went back and identified use support, causes, and sources for individual stream segments, which proved to be a useful level of resolution. One goal in any delineation scheme is to assemble data at a resolution sufficient to

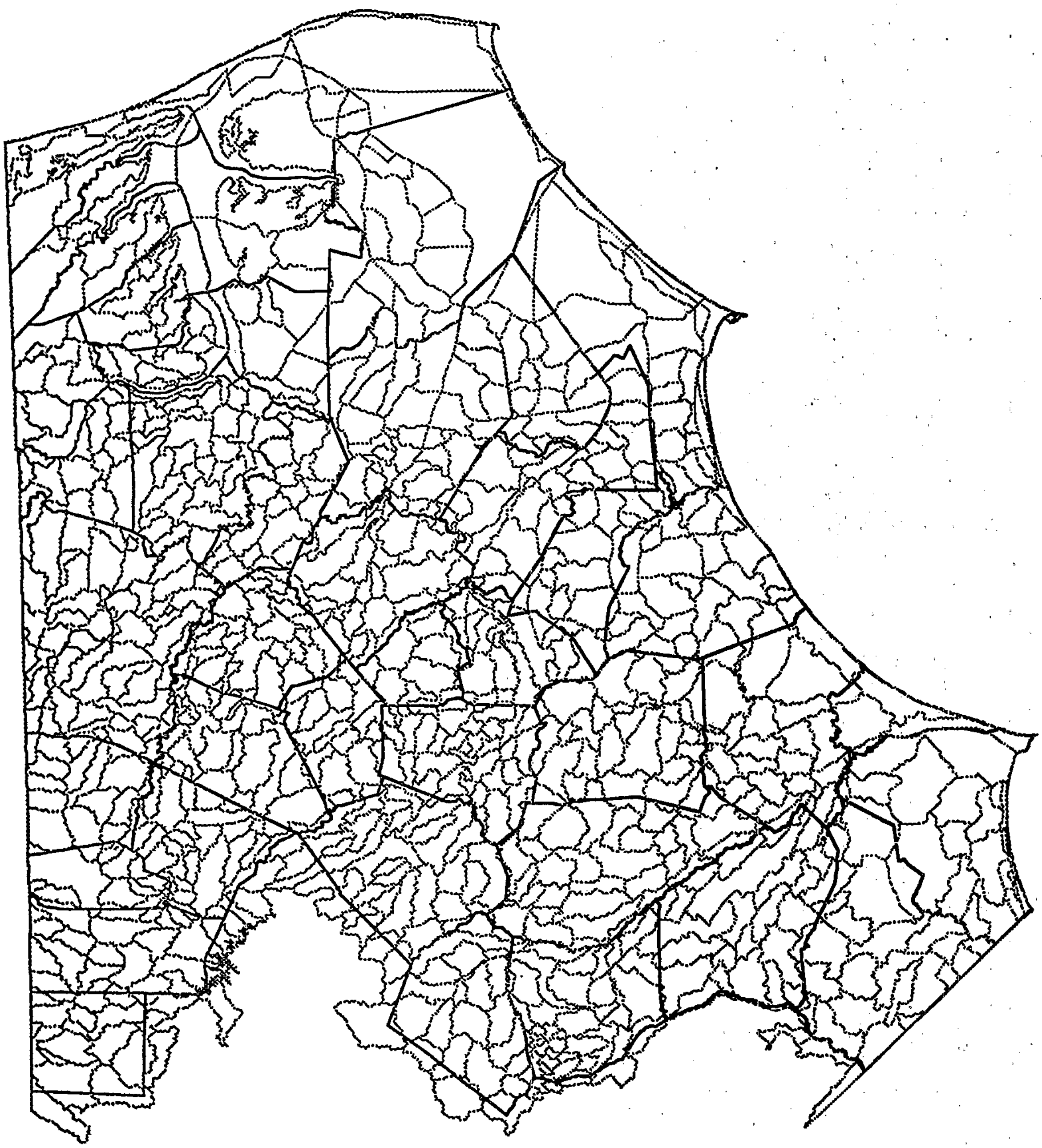


Figure 4-2. 14-digit SCS Watersheds in Eastern North Carolina (dark lines are county boundaries)

answer the questions that are important for management, without spending more resources than necessary to obtain data.

South Carolina, on the basis of information developed in its first GIS effort, also developed some important locational information at significantly higher resolution. They used Global Positioning Satellite (GPS) technology to accurately identify the location of discharges. They are proceeding basin by basin throughout the State. Their GIS now has obvious value as a tool for management.

This type of functionality will become increasingly important as tools such as ArcView2 become available.* These, together with the ARC/INFO coverage produced by EPA's Reach Indexing project, will allow States to analyze their waterbody data spatially. The WBS route system data model (RTI, 1994) allows the State to geographically identify specific use support classifications down to the reach segment level.

Waterbody Delineation

Waterbodies have been defined on a wide range of criteria--from individual RF2 reaches, frequently used from 1986 to 1988, to SCS watersheds or other groupings conforming to administrative boundaries. Tracking of individual reaches probably gives too much resolution to waterbody data and complicates workload management. On the other hand, watershed-based approaches will give sufficiently specific information only if they identify the actual locations of use support classifications and causes and sources of impairment.

EPA recommends that States delineate waterbodies to be compatible with SCS 11- or 14-digit watersheds. This approach is especially appropriate where States are considering redelineating their waterbodies and where 14-digit watersheds have been delineated or the existing 11-digit SCS watersheds are truly hydrologically based (some 11-digit SCS watershed boundaries were determined by administrative criteria rather than strictly by hydrology). Where 14-digit watersheds will be delineated in the near future, a State might consider waiting for these boundaries before redelineating waterbodies. Figure 4-2 shows some of the 14-digit watersheds agreed upon by SCS and the State of North Carolina.

* Mention of trade names in this document does not constitute endorsement. ArcView2 is a new product that enables nonprogrammers to utilize ARC/INFO coverages to do mapping and spatial analysis. EPA has designated ARC/INFO (Environmental Systems Research Institute, Inc., ESRI) as a GIS standard for the Agency.

Table 4-1 describes two approaches to delineating waterbodies that are consistent with aggregating data at the watershed level. Although both approaches are acceptable, EPA recommends the first approach for States that are redelineating their waterbodies. A cornerstone of these approaches is flexible data management. That is, the level of detail of assessment data can vary from watershed to watershed depending on the unique causes and sources in each watershed.

Aggregating Assessment Data at Watershed, Basin, and Ecoregion Levels

EPA encourages States to develop the **capability** to aggregate assessment data at the watershed, basin, and ecoregion levels. EPA is not asking States to present aggregated assessment data by SCS or USGS watershed or ecoregion in the 305(b) report, but rather to develop the capability to do so by including locational data. However, States are encouraged to begin reporting aggregated data by river basin if possible (e.g., Tables 7-3, 7-5, 7-6; see also Appendix H).

Using SCS watersheds as basic units for aggregating water quality assessment data will aid in data integration and in making other agencies' data available to the States. If a State wishes to use waterbodies that are based on units other than SCS watersheds (e.g., stream segments and individual lakes), sufficient locational information should be included to allow aggregation of detail at the SCS watershed level or, at a minimum, at the HUC level. These locational data can be stored, for example, in WBS SCRF1 or SCRF2 files. At a minimum, WBS or other 305(b) databases should contain watershed identification numbers for each waterbody and, to the extent possible, waterbodies should not cross SCS or HUC watershed boundaries. Assessments can also be aggregated by ecoregion if ecoregion codes are stored in WBS for each waterbody, or in combination with a GIS coverage of ecoregions. Note: If waterbodies are georeferenced to RF3, and a GIS is available, aggregation of assessments can be done with the GIS.

4.4 Managing Assessment Information

The EPA Waterbody System (WBS) is a PC database of water quality assessment information. WBS was developed by EPA for States and other entities specifically for tracking and reporting assessments under 305(b). It provides a standard format for water quality assessment information and includes a software program for adding and editing data, generating reports, and transferring data between the PC and other platforms such as mainframes and GISs.

WBS has four main functions:

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

Table 4-1. Approaches for Delineating Waterbodies

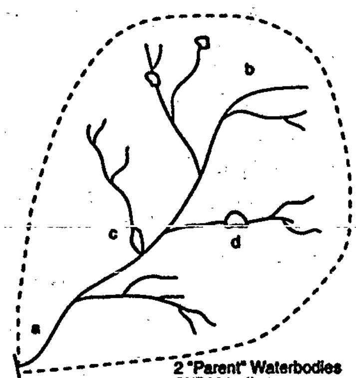
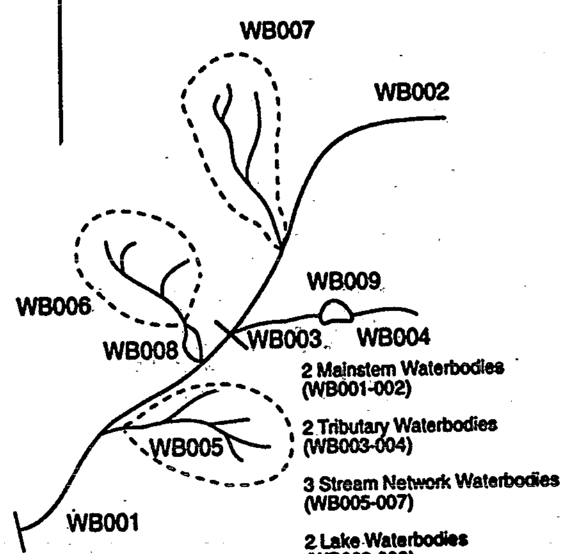
Approach	Description	Comments
All streams in a watershed are combined into a single waterbody; lakes are included as a separate waterbody (Recommended approach)	All streams in a watershed are combined into a single "parent" waterbody. Lakes are lumped into another waterbody. Virginia designated the entire State this way (approximately 490 small SCS watersheds). Ohio has designated about 1,000 small watersheds. Each watershed has 4 or 5 riverine waterbodies. Some waterbodies are main stem segments; some are networks of streams. South Carolina has designated about 200 SCS watersheds as waterbodies. South Carolina is now using GIS, global positioning system (GPS), and other programs to track use support, causes, sources, etc., at a greater level of detail within these watersheds. 	Many States have adopted or are considering this approach. If the watersheds are too large, assessments may not be as defensible. For example, a single assessment should not be applied to a watershed with 100 miles of streams of different sizes and sources of pollution. A reasonable range seems to be 300-1,000 watersheds per State. Use of SCS watersheds is recommended. States like Virginia and South Carolina have found it necessary to track assessments at the individual stream segment and lake level. The WBS detailed option and the WBS route system data model can provide this greater detail. Detailed tracking is critical to consistent National or statewide reporting of use support, causes, sources, etc. States can learn from other States' experiences with this approach. *Note: a related approach is to split out certain stream segments and lakes as separate waterbodies. These might include main stems or stream segments and lakes with special problems or significance. The remaining stream segments in the watershed are then combined into one stream waterbody, and the remaining lakes into one lake waterbody.*

Table 4-1. Approaches for Delineating Waterbodies (continued)

Approach	Description	Advantages, Disadvantages, Comments
Mix of individual stream segments, stream networks, and lakes	Several States use a mix of waterbodies: • mainstem stream segments • individual tributaries • individual lakes • stream networks--tributaries in a small watershed make up one waterbody • lakes in a small watershed make up one waterbody	Provides flexibility in the number of waterbodies and in level of detail State wants to track State can minimize use of the WBS detailed option, which tends to add complexity; however, detailed option is available if needed States can learn from other States' experiences Ideally, the number of waterbodies should be in a tractable range--perhaps up to 1,500 waterbodies With georeferencing to RF3, this approach is powerful in its ability to interface with GIS and EPA databases. For tracking and reporting by watershed, watershed boundaries can be overlaid on these waterbodies using a GIS, or watershed ID numbers can be stored in WBS



- To improve the quality and consistency of water quality reporting among the States
- To provide data for national level assessments and for analyzing water quality issues outside of 305(b)
- To be a useful water quality management tool for State agencies.

These 305(b) Guidelines and user requests determine the features of the WBS. The Guidelines require States to track dozens of data types for each waterbody (each State has from several hundred to several thousand waterbodies) in order to generate the summary tables required in Section 7. Although most WBS features result from the 305(b) Guidelines, WBS also contains some data elements that States have requested for internal management purposes (e.g., georeferencing fields and memo fields).

WBS contains over 100 data elements in such categories as:

- Descriptors — waterbody name, number, description, type (stream, lake, etc.), size
- Locational data elements — Reach File coordinates, basin and watershed identifiers
- Assessment data — degree of use support for each use, size impaired, causes and sources, type of monitoring, type of assessment, assessment confidence.

For detailed information about the WBS, see the *WBS96 Users Guide* (U.S. EPA, 1995b). EPA also provides ongoing technical support to WBS users. Between January and August 1994, EPA provided over 180 consultations to 48 different entities, including the States, Territories, Tribes, and Interstate Commissions, on the use of WBS and RF3 for 305(b) programs.

Data Management Options for Aggregating Data by Watershed

At least three options are available for aggregating assessment data by watershed. These options are compatible with WBS and the approaches described in Table 4-1.

1. Entirely within WBS. The WBS Detailed Option provides for parent waterbodies at the watershed level and detailed segments within the watershed for tracking use support, causes, and sources. Watersheds with relatively uniform water quality and sources might need only two parent waterbodies, one for all streams and another for all lakes. More

complex watersheds might need additional waterbodies (e.g., for main stem segments impacted by point sources or major recreational lakes).

2. WBS in combination with a GIS program. WBS can be used to store assessment data in combination with GIS programs such as ARC/INFO or ArcView2, which enable users to analyze spatial data and prepare maps. ArcView2 runs on PCs and users do not need to learn the complex ARC/INFO programming language. It uses standard ARC/INFO data coverages (e.g., reach-indexed waterbodies or STORET monitoring stations). (See previous note regarding mention of trade names.)

3. Entirely within the GIS environment. States with full GIS capability (e.g., having access to ARC/INFO programmers and workstations) can manage assessment data within the GIS environment and export results to WBS for reporting.

4.5 Moving Toward a Five-year Reporting Cycle

With the support of the 305(b) Workgroup, the ITFM, and many States, the EPA Office of Water is recommending a target of a 5-year 305(b) reporting cycle including a comprehensive identification of impaired/ threatened waters (combined 303(d), 314(a), 319, 320, wetlands, and ground water). See Figure 4-1.

States have suggested the following advantages of a 5-year cycle:

- Few water quality changes occur in a 2-year period, yet the burden of preparing biennial reports is roughly the same each cycle.

- A 5-year cycle would be consistent with statewide basin management under the Watershed Protection Approach; in this approach, a State typically completes monitoring, permitting, and management plan development for each basin every 5 years (although other cycle lengths are possible under the Watershed Protection Approach).

- The effort saved by preparing a 305(b) report every 5 years instead of every 2 years could be spent keeping assessments and assessment databases up to date.

- The new 106 Monitoring Guidelines and the final ITFM report recommend that States assess waters comprehensively in 4 to 10 years using a rotating basin approach.

If a targeted 5-year 305(b) cycle were implemented, the most likely scenario is that EPA would require first comprehensive State 305(b) reports in April 2001. States would, however, transmit annual updates of assessment data to WBS as part of the modernized STORET. This requirement would promote an ongoing program of assessment updates in each State and could avoid the large number of errors and other problems associated with last-minute updates. States would update individual assessments every year but not their 305(b) summary tables because these tables represent a large part of the labor associated with a 305(b) report.

If necessary, EPA would submit a brief biennial report or letter to Congress based on a core set of information from the State databases and any information of special interest or concern transmitted by the States.

Figure 4-3 shows an example schedule and sequence of events in a 5-year 305(b) cycle for a State. This chart is presented for discussion purposes only and is not considered guidance at this time.

4.6 Valid and Comparable Assessments

Valid and comparable assessments within and among States is a long-term goal of the 305(b) program. Comparability here means that a given waterbody would be assessed as having the same degree of use support (full, partial, or nonsupport) by different individuals within the agency or in other States. EPA, the 305(b) Workgroup, and the ITFM and its successor, the National Monitoring Council, will provide the technical approaches and institutional coordination needed to reach this goal of full comparability among the States, which will take longer than 1996 to realize. EPA believes that improvements are needed in each of the six elements in Table 4-2 in order to move closer to the goal of valid and comparable assessments among States.

4.7 ITFM and 305(b) Assessments

Formed in 1992, the ITFM is a 3-year program to improve the effectiveness and coordination of water quality monitoring efforts nationwide. ITFM includes representatives from 20 Federal, State, Tribal, and interstate organizations; its chair and vice chair are from EPA and USGS, respectively. An additional 150 individuals from Federal and State agencies participate on nine working groups. In addition, there is an associated advisory group with members from municipalities, academia, business and industry, and volunteer groups. In its draft final report (ITFM, 1994b), ITFM recommends a nationwide monitoring strategy and technical improvements to better answer the following questions:

1. What is the condition of the Nation's surface and ground waters?
2. Where, how, and why are water quality conditions changing over time?
3. Where are water quality problems, and what is causing the problems?
4. Are programs to prevent or remediate the problems working effectively?
5. Are we meeting water quality goals and standards?

Figure 4-3. Comprehensive State-Wide Assessment Timing - Example

Watershed	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
1st 20%	Monitor	Assess	TMDL	TMDL/ Implement	Implement	Monitor	Assess	TMDL	TMDL/ Implement	Implement	Monitor	Assess
2nd 20%	Historical Information	Monitor	Assess	TMDL	TMDL/ Implement	Implement	Monitor	Assess	TMDL	TMDL/ Implement	Implement	Monitor
3rd 20%			Monitor	Assess	TMDL	TMDL/ Implement	Implement	Monitor	Assess	TMDL	TMDL/ Implement	Implement
4th 20%				Monitor	Assess	TMDL	TMDL/ Implement	Implement	Monitor	Assess	TMDL	TMDL/ Implement
5th 20%					Monitor	Assess	TMDL	TMDL/ Implement	Implement	Monitor	Assess	TMDL
State		Annual State Electronic Assessment Reporting				Annual State Electronic Assessment Reporting					Electronic Reporting	
State	Last 1996 two-year State 305(b) Report					First five-year State 305(b) Report & Compre-hensive List					Second five-year State 305(b) Report & Compre-hensive List	
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EPA		Last traditional 1996 two-year 305(b) Report to Congress		First abbreviated Report to Congress			First five-year 305(b) Report to Congress		Second abbreviated Report to Congress			Second five-year 305(b) Report to Congress

Note: The shaded areas indicate monitoring and assessment activities to produce 305(b) Reports. The Comprehensive List includes 303(d), 314(a), 319(a), 320, wetlands, and ground water.

Table 4-2. Conditions Necessary for Valid and Comparable 305(b) Assessments

Condition	Why Necessary	ITFM Activities and Recommendations
1. Valid/comparable indicators to measure progress toward national goals	For acceptance by the public and professionals, indicators must be appropriate to the monitoring goal and scientifically valid. Valid means measurable, sensitive to the impacts being evaluated, able to discriminate change, accurate, and reproducible Indicators must be similar enough among monitoring programs to allow comparison and aggregation of results with confidence (e.g., at the regional or national level)	Developed indicator selection criteria; developed matrices of biological response and exposure, chemical exposure and response, physical habitat and watershed-level stressors Recommended standard base monitoring indicators for each designated use Examined ecological condition/aquatic life indicators and made recommendations; selected as first step in implementing the national strategy the assessment of "biological condition of streams and rivers" Recommended a suite of ground water indicators Recommended a reconstituted Environmental Indicators Committee to develop guidance for selecting indicators and criteria for reference conditions
2. Valid/comparable field and laboratory methods	Methods for sampling and analyzing for indicators must be scientifically valid, meaning measurable, sensitive to the impacts being evaluated, able to discriminate change, accurate, and reproducible Methods must yield comparable data of known quality among monitoring agencies to allow comparison and aggregation of results (e.g., at the regional or national level)	Endorsed multimetric approach to aquatic life assessments; compiled metrics used in U.S. Endorsed and documented reference condition approach to aquatic life assessments Obtained multiagency agreement to standardize taxonomic codes Sponsoring a comparison of Federal/State monitoring methods in Wisconsin Recommended a Methods and Data Comparability Council to promote and coordinate the collection of monitoring data of known quality using performance-based monitoring methods to achieve comparability, where objectives are similar; does not recommend specific field/lab methods

Table 4-2 (continued)

Condition	Why Necessary	ITFM Activities and Recommendations
3. Valid/comparable monitoring designs	Monitoring design must be appropriate to the clear, quantifiable goals of the program; data quality objectives (DQOs) can help ensure that all questions will be answered with a specified accuracy.	Achieved high degree of institutional collaboration and agreement among Federal and State agencies on a strategy to improve ambient water quality monitoring nationwide Developed a flexible, targeted monitoring strategy that features: • goal-oriented monitoring • 4 categories of waterbodies based on management focus--maintenance/prevention, special protection, remediation/restoration, and waters of unknown quality • flexible designs within each category • interagency monitoring teams
4. Valid/comparable assessment methods (based on monitoring data and evaluative information)	Given a set of data, the result of an assessment (full, partial or nonsupport) should ideally be the same regardless of the assessor. A criticism of 305(b) is that assessment methods among States are too dissimilar for comparison or aggregation of results	Within each Federal, State and local monitoring program, a core set of indicators, chosen by mutual agreement, would be shared for regional or national assessment and aggregation
5. Adequate documentation of assessment quality	Other users of assessment information need to know the quality of assessments to determine compatibility with their data	Recommended as necessary for field and laboratory methods and data management

Table 4-2 (continued)

Condition	Why Necessary	ITFM Activities and Recommendations
6. Effective information management and data sharing	Assessment databases must be able to track and report on large numbers of assessments, or the entire assessment process can fail. These systems must also communicate with other water data systems through common fields and codes	Developed a glossary of recommended data elements for monitoring organizations to include in their data systems Designated 23 data elements as minimum elements for facilitating information exchange among agencies Recommended development of an easy-to-use standard interface to individual water data systems; standard export formats and query systems; incorporation of meta data; use of common reference tables; and networked, distributed data systems rather than only centralized databases.

EPA urges all 305(b) Coordinators to read the three ITFM reports, which are expected to have a profound impact on the future of water quality monitoring (ITFM, 1992, 1994a, and 1994b).

The following box lists ITFM's major recommendations, not just those pertaining directly to 305(b).

Major ITFM Recommendations

Work Together

- Incorporate monitoring as a critical element of program planning, implementation, and evaluation.
- Use collaborative teams made up of monitoring organizations from all levels of government and the private sector to plan and implement monitoring improvements in geographic areas. Include volunteer monitoring efforts in these teams.
- Establish a National Water Quality Monitoring Council with representation from all monitoring sectors to develop guidelines for voluntary use by monitoring teams nationwide, to foster technology transfer and training, and to coordinate planning and resource sharing.
- Link national ambient water quality assessment programs.

Share Data

- Agree on sets of widely useful key physical, chemical, and biological indicators to support interjurisdictional aggregations of comparable information for decisionmaking across many scales.
- Use meta data standards to document and describe information holdings and to help secondary users judge whether data are useful for their applications.
- Link information systems to provide easier access by a wide variety of users to available holdings.

Use Comparable Methods

- Jointly develop and adopt for common use indicator and data element names, definitions, and formats.
- Implement a performance-based monitoring methods system (PBMS) to achieve comparable data, more flexible use of monitoring methods, and more cost-effective monitoring.
- Jointly establish reference conditions or sites for shared use in biological and ecological assessments and comparisons. Reference conditions are critically needed to establish baseline conditions against which other waterbodies or habitats can be evaluated.

(continued)

Major ITFM Recommendations (continued)

Monitoring Program Goals and Designs

- Design water quality monitoring programs and select indicators to measure progress in meeting clearly stated goals for aquatic resources including State standards for designated uses.
- Use flexible monitoring program designs tailored to the conditions, uses, and goals for water resources in specific areas.
- Use watersheds, ground water basins, ecoregions, or other natural boundaries as planning and evaluation units for monitoring.
- Periodically evaluate monitoring efforts to ensure that they continue to meet management goals cost-effectively.

Report Findings

- Regularly interpret, assess, and report measurements and raw data for use by the public and decisionmakers.

Many of the ITFM's activities and recommendations relate to the key conditions for valid and comparable assessments in Table 4-2. The last column in Table 4-2 links these key conditions to specific ITFM activities and recommendations. Improvements in the 305(b) process based on ITFM recommendations and those of the National Water Quality Monitoring Council will continue over the next several years, as technical guidance is issued on such topics as monitoring and laboratory methods, assessment methods, monitoring design, and data management and sharing.

SECTION 5

MAKING USE SUPPORT DETERMINATIONS

This section presents EPA's recommended approaches to making use support decisions for individual waterbodies. Designated uses addressed are: aquatic life, fish consumption, recreational uses such as swimming, and drinking water.

5.1 Aquatic Life Use Support (ALUS)

[Note: Addendum A includes, for your information, review, and comment, a concept for making ALUS determinations with both biological/habitat data and physical/chemical data. The EPA/State 305(b) Consistency Workgroup drafted the concept for small rivers and streams to outline a logical, scientifically defensible process for integrating ALUS determinations based on biological/habitat data and physical/chemical data. The concept is not guidance. It needs further development and the review of outside experts. The guidance described in this section (5.1) should be followed.]

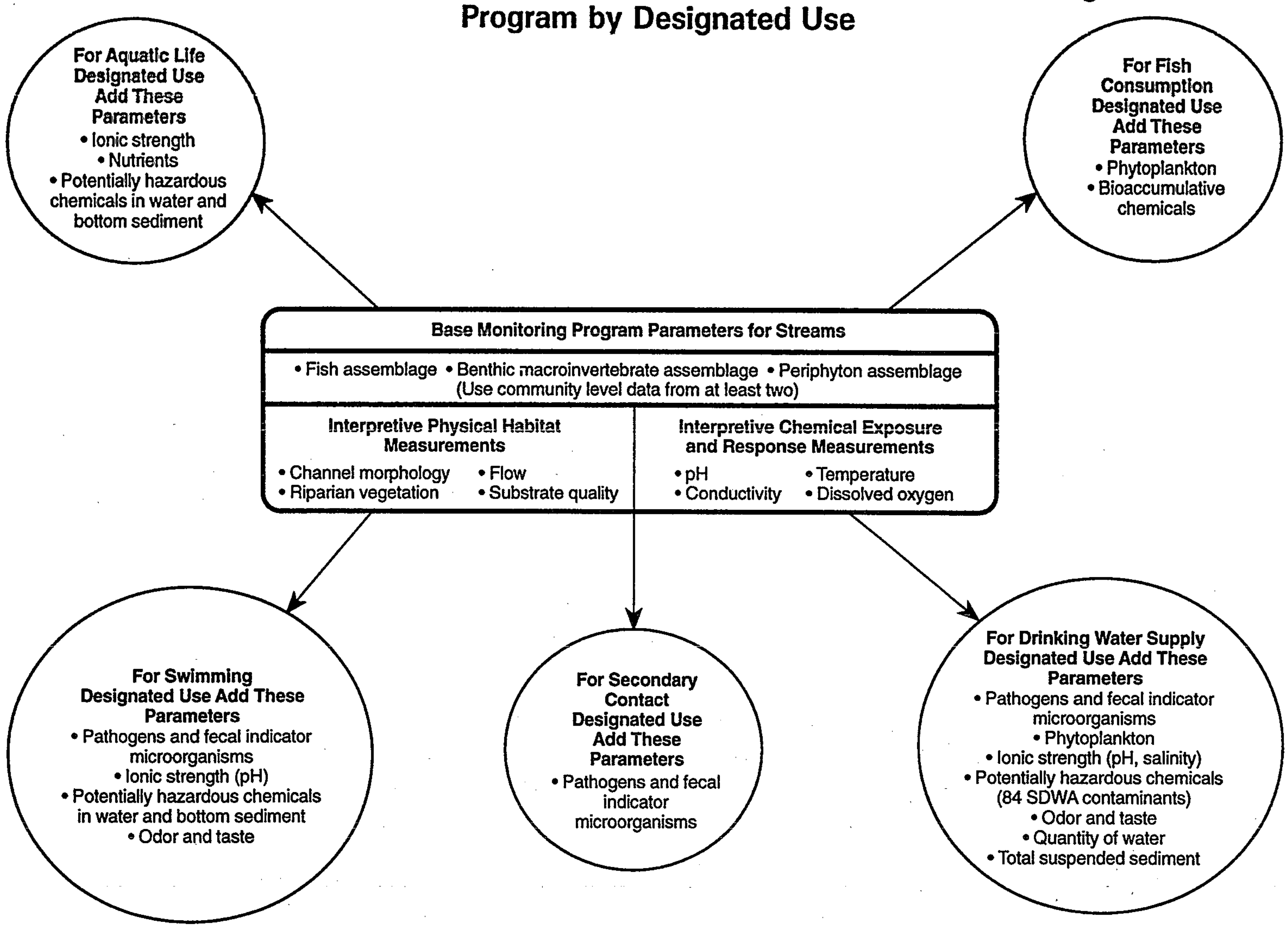
5.1.1 Independent Application

In July 1991, EPA transmitted final national policy on the integration of biological, chemical, and toxicological data in water quality assessments. According to this policy, referred to as "Independent Application," indication of impairment of water quality standards by any one of the three types of monitoring data (biological, chemical, or toxicological) should be taken as evidence of impairment regardless of the findings of the other types of data. One intent of this policy was to encourage States' progress in developing biological monitoring programs. For more information, see EPA's "Policy on the Use of Biological Assessments and Criteria in the Water Quality Program," May 1991). States should follow this policy of Independent Application when making ALUS decisions.

5.1.2 Valid and Comparable Indicators

For streams, EPA recommends ITFM's suite of parameters shown in Figure 5-1. These are general recommendations to consider when revising monitoring programs. The aquatic life use indicators would include the base monitoring program parameters in the box--community level biological data

Figure 5-1. Recommended Parameters for Stream Monitoring Program by Designated Use



Source: ITFM Environmental Indicators Task Group

from at least two assemblages, habitat, and physical/chemical field parameters--plus ionic strength, nutrients, and toxicants in water and sediment. ITFM makes a distinction between indicators that directly measure biological response, such as fish and benthic macroinvertebrate metrics, and indicators that measure exposure such as levels of pH, nutrients, and toxicants.

5.1.3 Valid and Comparable Field and Laboratory Methods

The National Water Quality Monitoring Council, ITFM's likely successor, will recommend specific methods for measuring the parameters shown in Figure 5-1. Standard methods for measuring the chemical parameters are well established among the States, but methods for biological assessments are not standardized. Recent work by the Ohio EPA suggests that bioassessment methods differ widely in their accuracy and discriminatory power for aquatic life use determinations (Yoder et al., 1994). Ohio has developed a hierarchy of bioassessment approaches from least confidence to most confidence (Table 5-1). In their State, Ohio EPA found that bioassessment approaches below Level 7 in Table 5-1 tend to be accurate if they detect impairment, but often miss impairment that is detected by higher-level methods. That is, approaches below Level 7 often give a false indication of full support.

Based on considerable information already available, EPA strongly endorses the regional reference approach for State bioassessment programs for streams (*Biological Criteria: Technical Guidance for Streams and Small Rivers*, Gibson et al., 1994). This corresponds to Level 9 in Table 5-1. If States choose not to implement a reference site approach, they are still encouraged to monitor two organism groups, with detailed taxonomy, a multimetric approach, and habitat evaluation. In calling for two organism groups, EPA seeks to include critical groups in the food chain that may react to different ecosystem stressors. EPA recognizes that the use of two organism groups or the regional reference approach may not be feasible in certain cases (e.g., streams in the arid west due to naturally occurring conditions such as extreme temperatures and lack of flow). EPA also recognizes that some State bioassessment programs are in their early stages and may not yet have the capability to use a regional reference site approach.

Many States are currently assessing a single organism group, benthic macroinvertebrates, with detailed taxonomy, a multimetric approach, and habitat evaluation (Level 7 in Table 5-1). These States are monitoring a critical group that often gives the greatest information about ecosystem health for the available resources. For fish sampling, some rely on their fish and game agencies, which are mainly oriented to game fish. As resources permit, EPA encourages State water quality agencies to develop the

Table 5-1. Hierarchy of bioassessment approaches from least confidence to most confidence developed by Ohio EPA (ITFM, 1994)

BIOASSESSMENT TYPE	SKILL REQUIRED[1]	ORGANISM GROUPS[2]	TECHNICAL COMPONENTS[3]	ECOLOGICAL COMPLEXITY[4]	ENVIRONMENTAL ACCURACY[5]	DISCRIMINATORY POWER[6]	POLICY RESTRICTIONS
1. Stream Walk (Visual Observations)	Non-biologist	None	Handbook[8]	Simple	Low	Low	Many
2. Volunteer Monitoring	Non-biologist to Technician	Invertebrates	Handbook[9], Simple equipment	Low	Low to Moderate	Low	Many
3. Professional Opinion (*e.g.*, RBP Protocol V)	Biologist w/ experience	None or Fish/Inverts.	Historical records	Low to Moderate	Low to Moderate	Low	Many
4. RBP Protocol I&II	Biologist w/ training	Invertebrates	Tech. Manual,[10] Simple equip.	Low to Moderate	Low to Moderate	Low to Moderate	Many
5. Narrative Evaluations	Aquatic Biologist w/training & experience	Fish &/or Inverts.	Std. Methods, Detailed taxonomy Specialized equip.	Moderate	Moderate	Moderate	Moderate
6. Single Dimension Indices	(same)	(same)	(same)	Moderate	Moderate	Moderate	Moderate
7. Biotic Indices (HBI, BCI, etc.)	(same)	Invertebrates	(same)	Moderate to High	Moderate to High	Moderate	Moderate to Few
8. RBP Protocols III&V	(same)	Fish & Inverts.	Tech. Manual,[10] Detailed taxonomy, Specialized equip., *dual* organism groups	High	Moderate to High	Moderate to High	Few
9. Regional Reference Site Approach	(same)	Fish & Inverts.	Same plus baseline calibration of multimetric indices & *dual* organism groups	High	High	High	Few
10. Comprehensive Bioassessment	(same)	All Organism Groups	Same except all organism groups are sampled	Highest	High	High	Few

[1] Level of training and experience needed to accurately implement and use the bioassessment type.
[2] Organism groups that are directly used and/or sampled; fish and macroinvertebrates are most commonly employed in the midwest states.
[3] Handbooks, technical manuals, taxonomic keys, and data requirements for each bioassessment type.
[4] Refers to ecological dimensions inherent in the basic data that is routinely generated by the bioassessment type.
[5] Refers to the ability of the ecological end-points or indicators to differentiate conditions along a gradient of environmental conditions.
[6] The relative power of the data and information derived to discriminate between different and increasingly subtle impacts.
[7] Refers to the relationship of biosurveys to chemical-specific, toxicological (i.e. bioassays), physical, and other assessments and criteria that serve as surrogate indicators of aquatic life use attainment/non-attainment.
[8] Water Quality Indicators Guide: Surface Waters (Terrell and Perfetti 1989)
[9] Ohio Scenic River Stream Quality Monitoring (Kopec and Lewis 1983).
[10] U.S. EPA Rapid Bioassessment Protocol (Plafkin et al. 1989).

capability for fish assemblage monitoring themselves or work with the fish and game staff to develop the needed capabilities.

5.1.4 Assessment Description for ALUS Determinations

In 1994, the 305(b) Consistency Workgroup and EPA concluded that descriptive information beyond degree of use support, causes, and sources is needed to fully define an assessment. "Assessment type" is one example of such data (see WBS Assessment Type Codes in Table 3-1); other examples include data sources and text descriptions of data fields. Such descriptors for characterizing assessments are collectively called "meta data."

Another important type of meta data is assessment quality, which is being incorporated into the Guidelines for the first time in 1996 and is referred to as "data description levels" and "assessment description levels." Documenting this information is important because, when assessments are aggregated or made available to other agencies, users often need to know the basis of the underlying information. Assessment quality information should become a part of State assessment databases.

At the Workgroup's recommendation, EPA is applying the description levels only to **ALUS determinations for wadable streams and rivers** where EPA's Rapid Bioassessment Protocols or other comparable methods can be applied. This is because aquatic life use is the most widely reported use, and monitoring methods for wadable streams and rivers are better documented and standardized (Plafkin et al., 1989) than for other surface water resources such as lakes and estuaries. The approach may be extended to ALUS determinations in other types of waterbodies as well as other designated uses in future 305(b) cycles based on the experience with ALUS in streams and rivers during the 1996 cycle.

Therefore, for wadable streams and rivers, EPA asks States to track two types of assessment description information as related to quality:

- Data description levels
- Assessment description levels.

<u>Data Description Levels</u>

For determining data description levels, data types are grouped into two categories: biological/habitat (B/H) data and physical/chemical (P/C) data. Tables 5-2 and 5-3 list many types of data that fall under the B/H and P/C categories. In Tables 5-2 and 5-3, Level 4 data are of highest quality and are most likely to indicate the true degree of ALUS, Level 3 data are of good quality resulting in defensible assessments, etc. ***Although data in Levels 4 through 1 vary in strengths and limitations, all are considered adequate for assessments.*** Data not adequate for ALUS determinations are excluded from

Table 5-2. Data Description Levels for ALUS: Biological/Habitat Data[a]

Level of Information	Monit. or Eval.	Types of Information[b]	WBS Assess. Type Codes
4	M	Direct biological and habitat measures during key seasons using a regional reference condition approach (baseline calibration of multimetric indices) and two organism groups; e.g., RBPs III and V (invertebrates and fish) or equivalent, or	310, 321,[c] 331[c]
	M	Other scientifically defensible methods for two organism groups with similar level of confidence (methods must be documented)	
3	M	Direct biological and habitat measures during key seasons using RBPs III and/or V (invertebrates and/or fish) or equivalent; may or may not involve regional reference condition approach; or	321,[c] 331[c]
	M	Other scientifically defensible methods having similar level of confidence (methods must be documented)	
2	M or E	Biomonitoring data or field evaluations during key seasons by skilled aquatic biologists. For streams, RBPs I (evaluative) or II (screening-level monitoring), or narrative evaluations with screening-level taxonomy of a single organism group, primary producer surveys, or	322,[c] 332[c]
	M	Tissue data from fish or other aquatic-based organisms indicating potential ecological hazard (e.g., selenium in the food chain), or	260
	M	Other scientifically defensible methods having similar level of confidence (methods must be documented), or	
	M or E	Strong information about natural reproducing fishery (e.g., surveys of fishery biologists such as RBP IV)	120

Table 5-2. (continued)

Level of Information	Monit. or Eval.	Types of Information[b]	WBS Assess. Type Codes
1[a]	M	Volunteer monitoring data with adequate QA and SOPs, or	820
	M	Limited biological/habitat monitoring data (less rigorous methods than levels 2-4 above)	NA
	M or E	Other scientifically defensible methods having similar level of confidence (methods must be documented)	
	E	Biological/habitat data extrapolated from an upstream or downstream waterbody where similar conditions are expected	190[c]
	E	Biological/habitat monitoring data >5 yrs old without further validation	150

NA = Not applicable
RBPs = Rapid Bioassessment Protocols (Plafkin et al., 1989)

[a] Assumes for each data type that sufficient coverage and frequency of data exist to make an assessment; e.g., Level 1 data are adequate for an assessment if no higher-level data exist.

[b] Based in part on *Determining the Comparability of Bioassessments* (Yoder et al., 1994)

[c] New Assessment Type Codes for Table 3-1 and WBS.

Note: Unless otherwise noted, the data types listed in the table assume that adequate QA/QC procedures and SOPs were followed for sample collection and analysis. Bacteriological data are not included because they are used mainly to assess human health uses. Most States have developed their own QA/QC and SOP documents. EPA references include

- *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish* (Plafkin et al., 1989)
- *Biological Criteria: Technical Guidance for Streams and Small Rivers* (Gibson et al., 1994)
- *Guidance on Lake and Reservoir Bioassessment and Biocriteria*, draft (U.S. EPA, 1994b)
- *Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories, Vol. 1: Fish Sampling and Analysis*, EPA 823-R-93-002 (U.S. EPA, 1992)
- *Guidance for the Data Quality Objectives Process*, EPA QA/G-4 (U.S. EPA, 1994a)

Table 5-3. Data Description Levels for ALUS: Physical/Chemical Data

Level of Information	Monit. or Eval.	Types of Information	WBS Assess. Type Codes
4	M	*Where impacts from nonchemical stressors (e.g, habitat degradation) are clearly not a factor:* long-term (e.g., >3 years), fixed-station monitoring with sufficient frequency and parametric coverage to capture acute events, chronic conditions, and all other potential P/C impacts. For example, monthly sampling during key periods (e.g., spring/ summer months; fish spawning seasons) including multiple samples at high and low flows. Depending on upstream sources, may require continuous monitoring or intensive surveys at near-critical flows. Including toxicant sampling and water column and/or sediment toxicity testing as appropriate, or Multiple, significant exceedances of one or more WQSs and there is little potential for false indications of impairment	231,[a] 250, 530, 540, 550
3	M	Long-term (e.g., >3 years), fixed-station monitoring with sufficient frequency and parametric coverage to capture acute events and all potential impacts. Typically, monthly sampling during key periods (e.g., spring/summer months; fish spawning seasons) including multiple samples at high and low flows. Depending on upstream sources, may require continuous monitoring or intensive surveys at near-critical flows. Including toxicant sampling and water column and/or sediment toxicity testing as appropriate, or	231,[a] 250, 530, 540, 550
	M	Long-term special studies during key seasons and at near-critical flows, e.g., involving multiple visits or automatic sampling over a period of months, or	222,[a] 242[a]
	M	Ambient toxicity testing at near-critical flows; sediment toxicity testing, sediment chemistry Other scientifically defensible methods having similar level of confidence (methods must be documented)	530, 540, 550, 250

Table 5-3. (continued)

Level of Information	Monit. or Eval.	Types of Information	WBS Assess. Type Codes
2[c]	M	Monthly or quarterly sampling of key parameters during key periods (e.g., spring/summer months; fish spawning seasons), including limited data at high and low flows; including toxicant sampling and water column and/or sediment toxicity testing as appropriate. Shorter period of record than for Level 4.	211,[a] 231,[a] 530, 540
	M	Special studies during key seasons near critical flows, e.g., involving multiple visits or automatic sampling over a period of days or multiple visits during a year or season of rotating basin surveys[c]	222,[a] 242[a]
	M	Calibrated models (calibration data <5 years old)	610
	M	Other scientifically defensible methods having similar level of confidence (methods must be documented)	
	M[c]	Volunteer monitoring data, long-term sampling of key parameters, with adequate QA and SOPs[b]	810

Table 5-3. (continued)

Level of Information	Monit. or Eval.	Types of Information	WBS Assess. Type Codes
1[c]	M	Fixed-station monitoring with limited period of record or parametric coverage; monthly or less frequent sampling; limited data during key periods or at high or low flows[c]	210, 230
	M	Short-term surveys (e.g., 1 day)	
	M	Effluent toxicity testing, acute or chronic	510, 520
	M	Discharger self-monitoring data	840, 850
	M	Other methods yielding limited monitoring data (less rigorous methods or less frequent than Levels 2-4 above)	
	M or E	P/C data extrapolated from an upstream or downstream station where homogeneous conditions are expected	870[a]
	E	Monitoring data >5 years old without further validation	150
	E	BPJ based on land use data, location of sources	130, 170
	E	Screening models (not calibrated or verified)	180

BPJ = Best professional judgment.
WQSs = Water quality standards.

[a] = New Assessment Type Code to be added to Table 3-1 and WBS.
[b] = Some States consider all volunteer monitoring data to be evaluative information as a matter of policy.
[c] = Even a short period of record can indicate a high confidence of *impairment* based on P/C data; 3 years of data are not required to demonstrate impairment. For example, a single visit to a stream with severe acid mine drainage impacts (high metals, low pH) can result in high confidence of nonsupport. However, long-term monitoring may be needed to establish full support.

Notes: Unless otherwise noted, this table assumes that adequate QA/QC procedures and SOPs were followed for sample collection and analysis for each data type. Also, table assumes that for each data type sufficient coverage and frequency of data exist to make an assessment; e.g., level 1 data are adequate for an assessment if no higher-level data are available.

Tables 5-2 and 5-3 (e.g., old land use information or old monitoring data in a watershed undergoing rapid development).

Tables 5-2 and 5-3 do not include every individual data type or every possible combination of data types. For example, a State might want to take into account other information such as fish kills in making ALUS determinations, or might have good habitat data but only limited biological community data for a given waterbody.

Assessment Description Levels

Tables 5-2 and 5-3 deal mainly with data quality and data quantity or temporal representativeness for ALUS determinations. However, to determine **assessment** levels the analyst must also consider the spatial representativeness of the information, in particular the size of the waterbody and number of monitoring sites. For example, an analyst might assign a **higher** description level than suggested in Table 5-3 in the case of a P/C dataset having broad parametric coverage, no statistically significant trends in chemical concentrations, and multiple monitoring sites in a 5-mile waterbody. Conversely, a **lower** level than suggested in Table 5-2 might be assigned in the case of a 10-mile waterbody with intensive B/H monitoring of only a single monitoring site.

Managing Use Support and Assessment Description Data

The Waterbody System for 1996 will contain new fields to track this descriptive information and related assessment results:

- Degree of use support suggested by B/H data
- B/H Assessment Description Level
- Degree of use support suggested by P/C data
- P/C Assessment Description Level.

EPA encourages States to store and provide this information for each river and stream assessment in addition to WBS Assessment Type Codes. This descriptive information will not be reported nationally.

Addendum A describes an approach under review by EPA for making ALUS determinations using both B/H and P/C data. The appendix includes hypothetical case studies of Assessment Description Levels for streams.

5.1.5 ALUS Assessments Using Biological/Habitat Data

Biological Assessment

A. Fully Supporting: Reliable data indicate functioning, sustainable biological communities (e.g., fish, macroinvertebrates, or algae) none of which has been modified significantly beyond the natural range of the reference condition.

B. Partially Supporting: At least one assemblage (e.g., fish, macroinvertebrates, or algae) indicates less than full support with slight to moderate modification of the biological community noted. Other assemblages indicate full support.

C. Not Supporting: At least one assemblage indicates nonsupport. Data clearly indicate severe modification of the biological community.

The interpretation of the terms "modified significantly," "slight to moderate modification," and "severe modification" is State-specific and depends on the State's monitoring and water quality standards programs. For example, Ohio EPA reports nonattainment (nonsupport) if none of its three fish and macroinvertebrate indices meet ecoregion criteria or if one organism group indicates severe toxic impact (Ohio's poor or very poor category), even if the other organism group indicates attainment. Partial support exists if one of two or two of three indices do not meet ecoregion criteria and are in the poor or very poor category (see Appendix F for more information on the Ohio approach).

The boxes on the following pages contain additional information for States on making ALUS determinations based on B/H data.

Additional Information on Biological Assessment of ALUS for Wadable Streams and Rivers

The information in these boxes may be useful to States in making ALUS determinations based on B/H data. Biological assessments are evaluations of the biological condition of waterbodies using biological surveys and other direct measurements of resident biota in surface waters and comparing results to the established biological criteria. They are done by qualified professional staff trained in biological methods and data interpretation. The utility of biological measures has been demonstrated in assessing impairment of receiving waterbodies, particularly that caused by nonpoint sources and nontraditional water quality problems such as habitat degradation. Biological assessments are key to determining whether functional, sustainable communities are present and whether any of these communities have been modified beyond the natural range of the reference condition. Functional and sustainable implies that communities at each trophic level have species composition, population density, tolerance to stressors, and healthy individuals within the range of the reference condition and that the entire aquatic system is capable of maintaining its levels of diversity and natural processes in the future (see Angermeier and Karr, 1994).

The techniques for biosurveys are still evolving, but there have been significant improvements in the last decade. Appropriate methods have been established by EPA (e.g., Plafkin et al., 1989), State agencies (e.g., Ohio EPA, 1987), and other investigators assessing the condition of the biota (e.g., Karr et al., 1986). Guidance for development of biocriteria-based programs is provided in the *Biological Criteria: National Program Guidance for Surface Waters* (U.S. EPA, 1990) and *Biological Criteria: Technical Guidance for Streams and Small Rivers* (Gibson et al., 1994). As biosurvey techniques continue to improve, several technical considerations apply:

- *The identification of the REFERENCE CONDITION is basic to any assessment of impairment or attainment of aquatic life use and to the establishment of biological criteria.*

  Reference conditions are described from an aggregate of data acquired from multiple sites with similar physical dimensions, represent minimally impaired conditions, and provide an estimate of natural variability in biological condition and habitat quality.

  Reference conditions must be stratified in order to account for much of the natural physical and climatic variability that affects the geographic distribution of biological communities. *The Ecoregion Concept* (Omernik, 1987) recognizes geographic patterns of similarity among ecosystems, grouped on the basis of environmental variables such as climate, soil type, physiography, and vegetation. Currently, efforts are under way in several parts of the country to refine these ecoregions into a more useful framework to classify waterbodies. Procedures have begun in several ecoregions and subecoregions to identify reference conditions within those particular units. In essence, these studies are developing reference databases to define biological potential and physical habitat expectations within ecoregions. The concept of reference conditions for bioassessment and biocriteria is discussed further below.

In developing community bioassessment protocols, reference conditions against which to compare test sites and to judge impairment are needed. Ideally, reference conditions represent the highest biological conditions found in waterbodies unimpacted by human pollution and disturbance. That is, the ecoregion/regionalized reference site concept is meant to accommodate natural variations in biological communities due to bedrock, soils, and other natural physicochemical differences. Recognizing that pristine habitats are rare (even remote lakes and streams are subject to atmospheric deposition), resource managers must decide on an acceptable level of disturbance to represent an achievable or existing reference condition. Acceptable reference conditions will differ among geographic regions and States and will depend on the aquatic life use designations incorporated into State water quality standards.

The best approach to classifying and characterizing regional reference conditions is determined by the estimated quality of potential reference sites that are available in the region. If a sufficient number of relatively undisturbed waterbodies exist (e.g., primarily forested watersheds), then it is possible to define watershed conditions acceptable for reference sites. If no reference sites exist, then reference conditions can be characterized based on an extrapolation of the biological attributes representative of the aquatic biota expected to be found in the region (see Gibson et al., 1994). EPA sees the use of a regional reference condition as an important component and goal of State biological programs. The Agency also recognizes that other approaches, such as upstream/downstream sampling, may be necessary (U.S. EPA, 1990).

Characterization of reference conditions depends heavily on classification of natural resources. Waterbodies vary widely in size and ecological characteristics, and a single reference condition that applies to all systems would be misleading. A classification system that organizes waterbodies into groups with similar ecological characteristics is required to develop meaningful reference conditions. The purpose of a classification is to explain the natural biological condition of a natural resource from the physical characteristics: for example, a deep, cold lake in the northern forested region of the Upper Midwest will often support a fish community characterized by trout or walleye as top predators (Heiskary et al., 1987).

The Ohio Environmental Protection Agency has been very active in the development of biocriteria based on reference conditions. Ohio's experiences and methods may be useful to other States in developing their biological monitoring and biocriteria programs (see, for example, Ohio EPA, 1987, 1990). For further information on the development and implementation of biological criteria and assessments, States should consult *Biological Criteria: National Program Guidance for Surface Waters* (U.S. EPA, 1990), *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish* (Plafkin et al., 1989), and *Biological Criteria: Technical Guidance for Streams and Small Rivers* (Gibson et al., 1994).

- *A MULTIMETRIC APPROACH TO BIOASSESSMENT is recommended to strengthen data interpretation and reduce error in judgment based on isolated indices and measures.*

The accurate assessment of biological integrity requires a method that integrates biotic responses through an examination of patterns and processes from individual to ecosystem levels (Karr et al., 1986). The preferred approach is to define an array of metrics that individually provide information on each biological parameter and, when integrated, function as an overall indicator of biological condition. The strength of such a multimetric approach is its ability to integrate information from individual, population, community, zoogeographic, and ecosystem levels into a single, ecologically based index of water resource quality (Karr et al., 1986). The development of metrics for use in the biocriteria process can be partitioned into two phases (Barbour et al., 1995). First, an evaluation of metrics is necessary to eliminate nonresponsive metrics and to address various technical issues (i.e., associated with methods, sampling habitat and frequency, etc.). Second, calibration of the metrics determines the discriminatory power of each metric and identifies thresholds for discriminating between "good" and "bad" sites. This process defines a suite of metrics that are optimal candidates for inclusion in bioassessments. Subsequently, a procedure for aggregating metrics to provide an integrative index is needed. For a metric to be useful, it must be (1) relevant to the biological community under study and to the specified program objectives; (2) sensitive to stressors; (3) able to provide a response that can be discriminated from natural variation; (4) environmentally benign to measure in the aquatic environment; and (5) cost-effective to sample. A number of metrics have been developed and subsequently tested in field surveys of benthic macroinvertebrate and fish assemblage (Barbour et al., 1995).

The conventional approach is to select some biological parameter that refers to a narrow range of changes or conditions and evaluate that parameter (e.g., species distributions, abundance trends, standing crop, or production estimates). Parameters are interpreted separately with a summary statement about the overall health. This conventional approach is limited in that the key parameters emphasized may not be reflective of overall ecological health.

- *Assessment of HABITAT STRUCTURE as an element of the biosurvey is critical to assessment of biological response.*

Interpretation of biological data in the context of habitat quality provides a mechanism for discerning the effects of physical habitat structure on biota from those of chemical toxicants. If habitat is of poor or somewhat degraded condition, expected biological values are lowered; conversely, if habitat is in good condition (relative to regional expectations), high biological condition values are expected. Poor habitat structure will prevent the attainment of the expected biological condition, even as water quality problems are ameliorated. If lowered biological values are indicated simultaneously with good habitat assessment rating scores, toxic or conventional contaminants in the system may have caused a suppression of community development. Additional chemical data may be needed to further define the probable causes (stressors). On the other hand, high biological metric scores in poor habitat could indicate a temporary response to organic enrichment, natural variation in colonization/mortality, change in predation pressures, change in food source/abundance, or other factors.

- *A standardized INDEX PERIOD is important for consistent and effective monitoring.*

  The intent of a statewide bioassessment program is to evaluate overall biological conditions. The capacity of the aquatic community to reflect integrated environmental effects over time can be used as a foundation for developing bioassessment strategies (Plafkin et al., 1989). An index period is a time frame for sampling the condition of the community that is a cost-effective alternative to sampling on a year-round basis. Ideally, the optimal index period will correspond to recruitment cycles of the organisms (based on reproduction, emergence, and migration patterns). In some instances, an index period would be oriented to maximize impact of a particular pollutant source (e.g., high-temperature/low-flow period for point sources). Sampling during an index period can (1) minimize between-year variability due to natural events, (2) optimize accessibility of the target assemblages, and (3) maximize efficiency of sampling gear.

- *STANDARD OPERATING PROCEDURES (SOPs) and an effective QUALITY ASSURANCE (QA) PROGRAM are established to support the integrity of the data.*

  The validity of the ecological study and resultant conclusions are dependent upon an effective QA Plan. An effective QA Plan at the onset of a study provides guidance to staff in several areas: objectives and milestones for achieving objectives throughout the study; lines of responsibility; accountability of staff for data quality objectives; and accountability for ensuring precision, accuracy, completeness of data collection activities, and documentation of sample custody procedures. Documented SOPs for developing study plans, maintenance and application of field sampling gear, performance of laboratory activities, and data analyses are integral quality control components of QA that can provide significant control of potential error sources.

- *AN IDENTIFICATION OF THE APPROPRIATE NUMBER OF SAMPLING SITES that are representative of a waterbody is an important consideration in evaluating biological condition.*

  The spatial array of sampling sites in any given watershed and the extrapolation of biological condition and water quality to areas beyond the exact sampling point must be established in any type of assessment. Two primary guidelines can be identified for extrapolating biological assessment data to whole watersheds. First, the structure of aquatic communities in lotic (flowing water) systems changes naturally with an increase in size of the stream. Thresholds in this continuum of change can be established through an analysis of regional databases. The biological condition at any particular site can only be used to represent upstream and downstream areas of the same physical dimensions and flow characteristics. Likewise, lake size will influence the number of sites needed to adequately characterize a lake or area of a lake. In small lakes, one site will generally be sufficient. In large lakes with multiple basins or in reservoirs with various zones (inflow, midsection, outflow), a site representative of each basin or zone may be needed.

  A second consideration for site identification is the change in land use patterns along a stream gradient or lake shoreline. Changes from agricultural land use to urban centers, forested parkland, etc., would warrant different representative sampling sites. A waterbody with multiple dischargers may also require numerous sampling sites to characterize the overall biological condition of the waterbody.

Special Considerations for Lakes

State lake managers should address a broad array of parameters in making lake ALUS decisions. Many of these parameters may not have specific criteria (e.g., algal blooms, growth of nuisance weeds) but have important effects on lake uses. Many are also indicators of the level of lake eutrophication.

Lake resources vary regionally, even within States, due to variations in geology, vegetation, hydrology, and land use. Therefore, regional patterns of lake water quality, morphometry (physical characteristics such as size, shape, and depth), and watershed characteristics should ideally be defined based on comparison to natural conditions using an ecoregion approach. The State can then set reasonable goals and criteria for a variety of parameters. These regional patterns apply to natural lakes only.

EPA is developing guidance on bioassessment protocols and biological criteria development for lakes and reservoirs (*Guidance on Lake and Reservoir Bioassessment and Biocriteria*, draft, U.S. EPA, 1994b). Draft guidance is currently being revised to address informal State and Tribal review comments. Review by EPA's Science Advisory Board is planned for 1995. Notice of availability for public review and comment in the *Federal Register* is planned for 1996.

5.1.6 Aquatic Life Assessments Using Physical/Chemical Data

This guidance is provided to encourage the best and most nationally consistent use of physical/chemical data. EPA recognizes that many States may not always collect a broad spectrum of chemical data (and data on additional indicators such as fishing restrictions) for every waterbody. Therefore, States are expected to apply the following guidance to whatever data are available and to use a "worst case" approach where multiple types of data are available. If, for example, chemical data indicate full support but temperature data indicate impairment, the waterbody is considered impaired based on the available P/C data.

Toxicants (priority pollutants, chlorine, and ammonia)

A. Fully Supporting: For any one pollutant, no more than one violation of acute criteria (EPA's criteria maximum concentration or applicable State criteria) within a 3-year period, based on at least 10 grab or 1-day composite samples.

B. Partially Supporting: For any one pollutant, criteria exceeded more than once within a 3-year period, but in $\leq$10 percent of samples.

C. Not Supporting: For any one pollutant, criteria exceeded in >10 percent of samples.

Note: The above assumes at least 10 samples over a 3-year period. If fewer than 10 samples are available, the State should use discretion and consider other factors such as the number of pollutants having a single violation and the magnitude of the exceedance(s).

Special Considerations Regarding Metals

The implementation and application of metals criteria is complex due to the site-specific nature of metals toxicity. EPA's policy is for States to adopt and use the dissolved metal fraction to set and measure compliance with water quality standards, because dissolved metal more closely approximates the bioavailable fraction of metal in the water column than does total recoverable metal. Table 5-4 provides guidance for calculating EPA dissolved criteria from the published total recoverable criteria. The data, expressed as percentage metal dissolved, are presented as recommended values and ranges. If a State is collecting dissolved metal data but does not yet have dissolved criteria, Table 5-4 might be useful for estimating screening values. Also, if total recoverable metal concentrations are less than the estimated dissolved metal criteria calculated from Table 5-4, the State could be relatively certain that toxic concentrations are not present.

Some States have already developed and are using dissolved metals criteria and should continue to do so. In the absence of dissolved metals data and State criteria, States should continue to apply total recoverable metals criteria to total recoverable metals data because this is more conservative and thus protective of aquatic life.

Historical metals data should be used with care. Concern about the reliability of the data are greatest below about 1 ppb due to the possibility of contamination problems during sample collection and analysis. EPA believes that most historical metals concentrations above this level are valid if collected with appropriate QA and QC.

Other Considerations Regarding Toxicant Data

- States should document their sampling frequency. Sampling frequency should be based on potential variability in toxicant concentrations. In general, waters should have at least quarterly data to be considered monitored; monthly or more frequent data are considered abundant. More than 3 years of data may be used, although the once-in-3-years consideration still applies (i.e., two violations are allowed in 6 years of abundant data).

Table 5-4. Recommended Factors for Converting Total Recoverable Metal Criteria to Dissolved Metal Criteria

Metal	Recommended Conversion Factors	
	CMC[a]	CCC[a]
Arsenic (III)	1.000	1.000
Cadmium[b]		
Hardness = 50 mg/L	0.973	0.938
Hardness = 100 mg/L	0.944	0.909
Hardness = 200 mg/L	0.915	0.880
Chromium (III)	0.316	0.860[c]
Chromium (VI)	0.982	0.962
Copper	0.960	0.960
Lead[b]		
Hardness = 50 mg/L	0.892	0.892
Hardness = 100 mg/L	0.791	0.791
Hardness = 200 mg/L	0.690	0.690
Nickel	0.998	0.997
Selenium	0.922	0.922
Zinc	0.978	0.986

[a] CMC = Criterion Maximum Concentration
CCC = Criterion Continuous Concentration

[b] The recommended conversion factors (CFs) for any hardness can be calculated using the following equations:

Cadmium
CMC: CF = 1.136672 - [(ln hardness) (0.041838)]
CCC: CF = 1.101672 - [(ln hardness) (0.041838)]

Lead (CMC and CCC): CF = 1.46203 - [(ln hardness) (0.145712)]

where:
(ln hardness) = natural logarithm of the hardness. The recommended CFs are given to three decimal places because they are intermediate values in the calculation of dissolved criteria.

[c] This CF applies only if the CCC is based on the test by Stevens and Chapman (1984). If the CCC is based on other chronic tests, it is likely that the CF should be 0.590, 0.376, or the average of these two values.

Source: Stephen, C. E. 1995. *Derivation of Conversion Factors for the Calculation of Dissolved Freshwater Aquatic Life Criteria for Metals*. U.S. EPA, Environmental Research Laboratory, Duluth.

- The once-in-3-years goal is not intended to include spurious violations resulting from lack of precision in analytical tests. Therefore, using documented quality assurance/quality control (QA/QC) assessments, States may consider the effect of laboratory imprecision on the observed frequency of violations.

- If the duration and frequency specifications of EPA criteria change in the future, these recommendations should be changed accordingly.

- Samples should be taken outside of designated mixing zones or zones of initial dilution.

Conventionals (DO, pH, temperature)

A. Fully Supporting: For any one pollutant or stressor, criteria exceeded in ≤10 percent of measurements. In the case of dissolved oxygen, national ambient water quality criteria specify the recommended acceptable daily average and 7-day average minimums and the acceptable 7-day and 30-day averages. States should document the DO criteria being used for the assessment and should discuss any biases that may be introduced by the sampling program (e.g., grab sampling in waterbodies with considerable diurnal variation).

B. Partially Supporting: For any one pollutant, criteria exceeded in 11 to 25 percent of measurements. For dissolved oxygen, the above considerations apply.

C. Not Supporting: For any one pollutant, criteria exceeded in >25 percent of measurements. For dissolved oxygen, the above considerations apply.

Special Considerations for Lakes

For lakes, States should discuss their interpretation of dissolved oxygen, pH, and temperature standards for both epilimnetic and hypolimnetic waters. In addition, States should consider the turbidity and lake bottom siltation.

5.1.7 Valid Monitoring Designs for ALUS Assessment

Any monitoring and assessment program begins with setting goals and a monitoring design that can meet those goals. The history of water quality monitoring is replete with programs that could not answer key questions; examples include

- The watershed study where the monitoring organization assumes that flow data can be obtained after the fact based on "reference point" measurements off bridges, only to learn later that many streams lack the channel morphometry to develop a stage-discharge relationship

- The intensive survey where the laboratory's detection levels for metals prove inadequate to detect even concentrations above water quality standards

- The basin survey where management or the legislature poses the question "What is the statistical trend in biological integrity of our streams?" too late to be incorporated into monitoring design.

As discussed in Sections 1 and 4 of these Guidelines, EPA has a goal of comprehensively characterizing the Nation's streams, lakes, estuaries, and shorelines. These assessments will include monitored and evaluated assessments and may involve probability-based as well as targeted monitoring. To achieve this goal, EPA encourages States to incorporate a formal process of goal setting and monitoring design while meeting their own State-specific goals. ITFM provides general guidelines for the topics to consider in monitoring design in a technical appendix of its final report (ITFM, 1994b), and EPA's Section 106 monitoring guidance tailors the ITFM guidelines to the 106/305(b) process.

The Data Quality Objectives (DQO) process developed by EPA's Quality Assurance Management Staff is a specific approach to monitoring design that has been applied to monitoring programs in all media. The DQO process involves the stakeholders in the program in the design. Stakeholders itemize and clarify the questions being asked of a monitoring program, including the required level of accuracy in the answers. Generally, these questions are stated in quantitative terms ("What are the IBI and ICI values for wadable streams in Big River Basin, and what is the trend in IBI across the basin, with 80 percent certainty?"), and statistical methods may be recommended for selecting sites or sampling frequency. The EPA contact for DQOs for water quality monitoring is Martin Brossman (202) 260-7023.

To date, States have taken three main approaches to monitoring a large portion of their waterbodies:

- Fixed-station networks with hundreds or thousands of sites (most large networks have been reduced in the past 10 years)

- Rotating basin surveys with a large number of monitoring sites covering thousands of miles of waters (Ohio EPA's bioassessment program)

- Rotating basin surveys with a probabilistic monitoring design; a statistically valid set of sites are selected for sampling in each basin (Delaware's benthic macroinvertebrate program).

The National Council for Water Quality Monitoring may make recommendations about monitoring design; in the meantime, however, EPA encourages States to consider existing approaches such as Ohio's and Delaware's. In particular, EPA urges States to take advantage of monitoring data provided by other agencies such as USGS, NOAA, or the U.S. Fish and Wildlife Service.

5.2 Primary Contact Recreation Use

All States have recreational waterbodies with bathing areas, as well as less heavily used waterbodies with a designated use of swimming. In some States, nearly all waters are designated for swimming, although the great majority of waters are not used heavily for this purpose. States are asked to first target their assessments of primary contact recreation use to high-use swimming areas such as bathing beaches, a risk-based approach to targeting resources to protect human health.

5.2.1 Bathing Area Closure Data

States should acquire data on bathing area closures from State and local health departments and analyze them as follows.

A. Fully Supporting: No bathing area closures or restrictions in effect during reporting period.

B. Partially Supporting: On average, one bathing area closure per year of less than 1 week's duration.

C. Not Supporting: On average, one bathing area closure per year of greater than 1 week's duration, or more than one bathing area closure per year.

Some bathing areas are subject to administrative closures such as automatic closures after storm events of a certain intensity. Such closures should be reported along with other types of closures in the 305(b) report and used in making use support determinations if they are associated with violation of water quality standards.

5.2.2 Bacteria

States should base use support determinations on their own State criteria for bacteriological indicators.

EPA encourages States to adopt bacteriological indicator criteria for the protection of primary contact recreation uses consistent with those recommended in *Ambient Water Quality Criteria for Bacteria—1986* (EPA 440/5-84-002). This document recommends criteria for enterococci and *E. coli* bacteria (for both fresh and marine waters) consisting of:

- Criterion 1 = A geometric mean of the samples taken should not be exceeded, **and**

- Criterion 2 = Single sample maximum allowable density.

Many State criteria for the protection of the primary contact recreation use are based on fecal coliform bacteria as previously recommended by EPA (*Quality Criteria for Water—1976*). The previous criteria were:

- Criterion 1 = The geometric mean of the fecal coliform bacteria level should not exceed 200 per 100 mL for any 30-day period, **and**

- Criterion 2 = Not more than 10 percent of the total samples taken during any 30-day period should have a density that exceeds 400 per 100 mL.

If State criteria are based on either of EPA's criteria recommendations outlined above, States should use the following approach in determining primary contact recreational use support:

A. Fully Supporting: Criterion 1 and/or Criterion 2 met.

B. Partially Supporting:

   - For *E. coli* or enterococci: Geometric mean met; single-sample criterion exceeded during the recreational season, **or**

   - For fecal coliform: Geometric mean met; not more than 10 percent of samples exceed 2,000 per 100 mL.

C. Not Supporting: Neither geometric mean nor maximum criteria limits achieved.

This guidance establishes a minimum baseline approach; should States have more restrictive criteria, these may be used in place of EPA's criteria. Please indicate when this is the case.

5.2.3 Other Parameters

In addition to pathogens, some States have criteria for other pollutants or stressors for Primary Contact Recreation. As noted by the ITFM, potentially hazardous chemicals in water and bottom sediment, ionic strength, turbidity, algae, aesthetics, and taste and odor can be important indicators for recreational use support determinations. The following guidelines apply where appropriate (i.e., where States have water quality standards for other parameters).

A. Fully Supporting: For any one pollutant or stressor, criteria exceeded in ≤10 percent of measurements.

B. Partially Supporting: For any one pollutant, criteria exceeded in 11 to 25 percent of measurements.

C. Not Supporting: For any one pollutant, criteria exceeded in >25 percent of measurements.

5.2.4 Special Considerations for Lakes

Trophic Status--

Trophic status is traditionally measured using data on total phosphorus, chlorophyll *a*, and Secchi transparency. As mentioned above, comparison of trophic conditions to natural, ecoregion-specific standards allows the best use of this measure.

In this context, user perception surveys can be a useful adjunct to trophic status measures in defining recreational use support. Heiskary and Walker (1988) and Smeltzer and Heiskary (1990) offer a basis for linking trophic status measures with user perception information. This can provide a basis for categorizing use support based on trophic status data. If user perception data are not collected in the State, extrapolations using data from another State, i.e., best professional judgment, might provide the opportunity to characterize recreational use support in a similar fashion.

Pathogens--

States should consider pathogen data in determining support of recreational uses. Guidelines above also apply to lakes.

Additional Parameters--

In addition to trophic status and pathogens, States should consider the following parameters in determining support of recreational uses:

- Frequency/extent of algal blooms, surface scums and mats, or periphyton growth
- Turbidity (reduction of water clarity due to suspended solids)
- Lake bottom siltation (reduction of water depth)
- Extent of nuisance macrophyte growth (noxious aquatic plants)
- Aesthetics.

5.3 Fish/Shellfish Consumption Use

5.3.1 Fish/Shellfish Consumption Advisory Data

A. Fully Supporting: No fish/shellfish restrictions or bans are in effect.

B. Partially Supporting: "Restricted consumption" of fish in effect (restricted consumption is defined as limits on the number of meals or size of meals consumed per unit time for one or more fish/shellfish species).

C. Not Supporting: "No consumption" of fish or shellfish ban in effect for general population, or a subpopulation that could be at potentially greater risk, for one or more fish/shellfish species; or commercial fishing/shellfishing ban in effect.

In addition, the ITFM recommended specific indicators for assessing fish and shellfish consumption risks: levels of bioaccumulative chemicals in fish and shellfish tissue for fish and shellfish consumption, and, for shellfish only, paralytic shellfish poisoning (PSP)-type phytoplankton and microbial pathogens.

In areas where shellfish are collected for commercial or private purposes and removed to cleaner waters for depuration, the originating waterbodies should be considered Partially Supporting for Shellfish Consumption use.

5.4 Drinking Water Use

These Guidelines provide a framework for future assessments of drinking water use support. EPA recognizes that States will not have access to all the information needed to assess drinking water use for source waters in 1996. Nor is EPA asking States to do additional ambient monitoring of drinking water sources unless that fits in with other State priorities. Rather, States are asked to take advantage of available information in 1996, with an eye toward accessing additional information as it becomes available in the future (e.g., when the new Safe Drinking Water Information System (SDWIS) becomes available in each State).

As explained later in this section, EPA recommends that States use the following types of information in assessing drinking water use support:

- Ambient monitoring data or raw intake water quality data, if available, for Safe Drinking Water Act (SDWA) contaminants that could be present in the watershed, along with information on drinking water use restrictions

- Lacking the above, finished water data from public water supplies (PWSs) that draw from surface waterbodies, along with use restriction information.

State 305(b) Coordinators should work closely with their drinking water counterparts in obtaining and analyzing ambient and finished water data. The following scenario describes how the process might work in 1996 or future years in a typical State:

1. The 305(b) Coordinator does STORET retrievals and compares ambient water quality data to water quality standards and SDWA Maximum Contaminant Levels (MCLs) for waterbodies that are classified for drinking water use.

2. Staff in the State drinking water program identify all PWSs having only surface water sources, and work with the 305(b) Coordinator to link those PWSs with specific 305(b) waterbodies.

3. For the PWSs identified in (2) above, drinking water staff provide retrievals from the SDWIS database. These retrievals help identify waterbodies that are fully supporting (no MCL exceedances in finished water, no closures or advisories) or impaired (finished water data show MCL exceedances; closures or advisories have occurred; beyond-conventional treatment required).

4. With the above information, the 305(b) Coordinator and drinking water staff work together to assign levels of drinking water use support to each assessed waterbody according to the guidance in the remainder of this section and in the "Public Health: Drinking Water" part of Section 7 (p. 7-37).

Finished water quality data may also be used to indicate that treated drinking water supplies meet all applicable standards, even if there are indications of impairment in the ambient source water.

5.4.1 Assessing Rivers, Streams, Lakes, and Reservoirs

Table 5-5 (National Primary Drinking Water Regulations) lists the 84 contaminants regulated under the Safe Drinking Water Act and includes information on the MCL set for each contaminant in finished water. Contaminants that are generally not source- water-related (e.g., corrosion byproducts) are identified. **States are asked to consider the State Water Quality Standards for source-water-related contaminants (provided that they are at least as stringent as the MCL) in assessing drinking water use support for both surface water and ground water sources.**

Most PWSs are required to monitor their finished water for these chemical and microbiological contaminants. Monitoring for chemical contaminants follows a standardized monitoring framework, with the first round of monitoring for most contaminants to be completed by December 31, 1995. States should assess drinking water use support based on those contaminants that are known to be used or present in each watershed or basin.

Whenever possible, States should utilize ambient monitoring data in assessing drinking water use support of raw (or source) waters. For future reporting, EPA is considering ways to assist States in collecting raw water intake data, particularly for PWSs where monitoring data show MCL exceedances. States are encouraged to make obtaining raw water intake data for contaminants regulated under the SDWA a priority. As a secondary priority, States should seek raw water intake data for PWSs near ambient monitoring stations, in cases where data indicate that a waterbody may be impaired with respect to drinking water use.

EPA recognizes, however, that the best source of monitoring data for assessing drinking water use support may be from PWS compliance monitoring required under the SDWA (i.e., monitoring of finished waters) and from drinking water use restrictions imposed on source waters. Therefore, States are asked to consider available PWS compliance monitoring (i.e., finished water) data for contaminants that may be source-water-related, when ambient monitoring data are lacking or where ambient monitoring data indicate that the source waters may be impaired. Information concerning contamination-based drinking water use restrictions imposed on a source water should also be considered in assessing the drinking water use support of a waterbody.

Further, the availability of PWS compliance monitoring data for use in this assessment may vary by State (because of limited access through existing data systems) and the costs of collecting such data may be significant for the 1996 305(b) report. EPA recognizes that there will be variability in the data that States will be able to provide to support drinking water assessments for 1996. However, EPA hopes that the direction of future

Table 5-5. National Primary Drinking Water Regulations (February 1994)

Contaminants	MCLG (mg/L)	MCL (mg/L)	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
VOCs:				
Benzene	zero	0.005	Cancer	Some foods; gas, drugs, pesticide, paint, plastic industries
Carbon Tetrachloride	zero	0.005	Cancer	Solvents and their degradation products
o-Dichlorobenzene	0.6	0.6	Liver, kidney, blood cell damage	Paints, engine cleaning compounds, dyes, chemical wastes
p-Dichlorobenzene	0.075	0.075	Cancer	Room and water deodorants, "mothballs"
1,2-Dichloroethane	zero	0.005	Cancer	Leaded gas, fumigants, paints
1,1-Dichloroethylene	0.007	0.007	Cancer, liver and kidney effects	Plastics, dyes, perfumes, paints
cis-1,2-Dichloroethylene	0.07	0.07	Liver, kidney, nervous, circulatory	Waste industrial extraction solvents
trans-1,2-Dichloroethylene	0.1	0.1	Liver, kidney, nervous, circulatory	Waste industrial extraction solvents
Dichloromethane	zero	0.005	Cancer	Paint stripper; metal degreaser, propellant, extraction
1,2-Dichloropropane	zero	0.005	Liver, kidney effects, cancer	Soil fumigant, waste industrial solvents
Ethylbenzene	0.7	0.7	Liver, kidney, nervous system	Gasoline; insecticides; chemical manufacturing wastes
Monochlorobenzene	0.1	0.1		
Styrene	0.1	0.1	Liver, nervous system damage	Plastics, rubber, resin, drug industries; leachate from city landfills
Tetrachloroethylene	zero	0.005	Cancer	Improper disposal of dry cleaning and other solvents
Toluene	1	1	Liver, kidney, nervous, circulatory	Gasoline additive; manufacturing and solvent operations
1,2,4-Trichlorobenzene	0.07	0.07	Liver, kidney damage	Herbicide production; dye carrier
1,1,1-Trichloroethane	0.2	0.2	Liver nervous system effects	Adhesives, aerosols, textiles, paints, inks, metal degreasers
1,1,2-Trichloroethane	0.003	0.005		
Trichloroethylene	zero	0.005	Cancer	Textiles, adhesives and metal degreasers
Vinyl Chloride	zero	0.002	Cancer	May leach from PVC pipe; formed by solvent breakdown
Xylenes (total)	10	10	Nervous system effects	Gasoline, metal degreasers, and pesticides

Contaminants	MCLG (mg/L)	MCL (mg/L)	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
SOCs:				
Acrylamide[1]	zero	TT[2]	Cancer, nervous system effects	Polymers used in sewage/wastewater treatment
Alachlor	zero	0.002	Cancer	Runoff from herbicide used on corn, soybeans, peanuts, and other crops
Aldicarb*	0.001	0.003	Nervous system effects	Insecticide used on cotton, potatoes, and other crops; widely restricted
Aldicarb Sulfone*	0.001	0.002	Nervous system effects	Biodegradation of aldicarb
Aldicarb Sulfoxide*	0.001	0.004	Nervous system effects	Biodegradation of aldicarb
Atrazine	0.003	0.003	Mammary gland tumors	Runoff from use as herbicide on corn and non-cropland
Benzo(a)pyrene (PAHs)	zero	0.0002	Cancer	Coal tar coatings; burning organic matter; volcanoes, fossil fuels
Carbofuran	0.04	0.04	Nervous, reproductive system	Soil fumigant on corn and cotton; restricted in some areas
Chlordane	zero	0.002	Cancer	Leaching from soil treatment for termites
Dalapon	0.2	0.2	Liver, kidney	Herbicide used on orchards, beans, coffee, lawns, road/railways
Dibromochloropropane (DBCP)	zero	0.0002	Cancer	Soil fumigant used on soybeans, cotton, pineapple, orchards
Di(2-ethylhexyl) adipate	0.4	0.4	Decreased body weight; liver and testes damage	Synthetic rubber, food packaging, cosmetics
Di(2-ethylhexyl) phthalate	zero	0.006	Cancer	PVC and other plastics
Dinoseb	0.007	0.007	Thyroid, reproductive organ damage	Runoff of herbicide from crop and non-crop applications
Diquat	0.02	0.02	Liver, kidney, eye effects	Runoff of herbicide on land and aquatic weeds
Ethylene Dibromide (EDB)	zero	0.00005	Cancer	Leaded gas additives; leaching of soil fumigant
Endothall	0.1	0.1	Liver, kidney, gastrointestinal	Herbicide on crops, land/aquatic weeds; rapidly degraded
Endrin	0.002	0.002	Liver, kidney, heart damage	Pesticide on insects, rodents, birds; restricted since 1980
Epichlorohydrin[1]	zero	TT[2]	Cancer	Water treatment chemicals; waste epoxy resins, coatings
Glyphosate	0.7	0.7	Liver, kidney damage	Herbicide used on grasses, weeds, brush
Heptachlor	zero	0.0004	Cancer	Leaching of insecticide for termites, very few crops
Heptachlor epoxide	zero	0.0002	Cancer	Biodegradation of heptachlor
Hexachlorobenzene	zero	0.001	Cancer	Pesticide production waste by-product

*Regulation of these contaminants has been deferred. MCLGs and MCLs are proposed.

Contaminants	MCLG (mg/L)	MCL (mg/L)	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Hexachlorocyclopenta-diene	0.05	0.05	Kidney, stomach damage	Pesticide production intermediate
Lindane	0.0002	0.0002	Liver, kidney, nerve, immune, circulatory system	Insecticide used on cattle, lumber, gardens; restricted since 1983
Methoxychlor	0.04	0.04	Growth, liver, kidney, nerve	Insecticide used on fruits, vegetables, alfalfa, livestock, pets
Oxamyl (Vydate)	0.2	0.2	Kidney damage	Insecticide on apples, potatoes, tomatoes
PCBs	zero	0.0005	Cancer	Coolant oils from electrical transformers; plasticizers
Pentachlorophenol	zero	0.001	Cancer; liver and kidney effects	Wood preservatives, herbicide, cooling tower wastes
Picloram	0.5	0.5	Kidney, liver damage	Herbicide used on broadleaf and woody plants
Simazine	0.004	0.004	Cancer	Herbicide used on grass sod, some crops, aquatic algae
Toxaphene	zero	0.003	Cancer	Insecticide used on cattle, cotton, soybeans; cancelled in 1982
2,4-D	0.07	0.07	Liver and kidney damage	Runoff from herbicide on wheat, corn, rangelands, lawns
2,4,5-TP (Silvex)	0.05	0.05	Liver and kidney damage	Herbicide used on crops, right-of-ways, golf courses; cancelled in 1983
2,3,7,8-TCDD (Dioxin)	zero	0.00000003	Cancer	Chemical production by-product; impurity in herbicides
Inorganics:				
Antimony	0.006	0.006	Cancer	Fire retardants, ceramics, electronics, fireworks, solder
Arsenic (Interim)	0.05	0.05	Skin, nervous system toxicity	Natural deposits; smelters, glass, electronics wastes; orchards
Asbestos (>10μm)	7 MFL[3]	7 MFL[3]	Cancer	Natural deposits; asbestos cement in water systems
Barium	2	2	Circulatory system effects	Natural deposits; pigments, epoxy sealants, spent coal
Beryllium	0.004	0.004	Bone lung damage	Electrical, aerospace, defense industries
Cadmium	0.005	0.005	Kidney effects	Galvanized pipe corrosion; natural deposits; batteries, paints
Chromium (total)	0.1	0.1	Liver, kidney, circulatory disorders	Natural deposits; mining, electroplating, pigments
Copper[1]	1.3	TT[2]	Gastrointestinal irritation	Natural/industrial deposits; wood preservatives, plumbing
Cyanide	0.2	0.2	Thyroid, nervous system damage	Electroplating, steel, plastics, mining, fertilizer
Fluoride	4.0	4.0	Skeletal and dental fluorosis	Natural deposits; fertilizer, aluminum industries; water additive

Contaminants	MCLG (mg/L)	MCL (mg/L)	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Lead[1]	zero	TT[2]	Kidney, nervous system damage	Natural/industrial deposits; plumbing; solder, brass alloy faucets
Mercury (inorganic)	0.002	0.002	Kidney, nervous system disorders	Crop runoff; natural deposits; batteries, electrical switches
Nickel	0.1	0.1	Heart, liver damage	Metal alloys, electroplating, batteries, chemical production
Total Nitrate/Nitrate (as Nitrogen)	10	10	Methemoglobulinemia	Animal waste, fertilizer, natural deposits, septic tanks, sewage
Nitrite	1	1	Methemoglobulinemia	Same as nitrate; rapidly converted to nitrate
Selenium	0.05	0.05	Liver damage	Natural deposits; mining, smelting, coal/oil combustion
Sulfate (Proposed)	500	500	Diarrhea	Natural deposits
Thallium	0.0005	0.002	Kidney, liver, brain, intestinal	Electronics, drugs, alloys, glass
Microbiological and Surface Water Treatment:				
Cryptosporidium	N/A	N/A		
Giardia lamblia	zero	TT[2]	Gastroenteric disease	Human and animal fecal waste
Legionella	zero	TT[2]	Legionnaire's disease	Natural waters; can grow in water heating systems
Standard Plate Count	N/A	TT[2]	Indicates water quality, effectiveness of treatment	N/A
Total Coliform	zero	<5%+	Indicates gastroenteric pathogens	Human and animal fecal waste
Turbidity	N/A	TT[2]	Interferes with disinfection/filtration	Soil runoff
Viruses	zero	TT[2]	Gastroenteric disease	Human and animal fecal waste
Radioactive:				
Beta/photon emitters (Interim and Proposed)	zero	4 mrem/yr	Cancer	Decay of radionuclides in natural and man-made deposits
Alpha emitters (Interim and Proposed)	zero	15 pCi/L	Cancer	Decay of radionuclides in natural deposits
Combined Radium 226/228 (Interim)	zero	5 pCi/L	Bone cancer	Natural deposits
Radium 226 (Proposed)	zero	20 pCi/L	Bone cancer	Natural deposits
Radium 228 (Proposed)	zero	20 pCi/L	Bone cancer	Natural deposits
Radon (Proposed)	zero	300 pCi/L	Cancer	Decay of radionuclides in natural deposits
Uranium (Proposed)	zero	0.02	Cancer	Natural deposits

Contaminants	MCLG (mg/L)	MCL (mg/L)	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Disinfection Byproducts:				
Total Trihalomethanes[1] (Interim)	zero	0.10	Cancer	Drinking water chlorination byproducts

[1] Contaminants generally created during treatment by the public water system (e.g., during disinfection) or caused by actions in the distribution system (e.g., corrosion byproducts).

[2] Treatment Technique (TT) required. EPA develops a TT for a contaminant when it is not feasible to set a numerical limit (an MCL) for that contaminant. A TT is a procedure or series of procedures that a PWS automatically follows to comply with a drinking water regulation.

[3] Million Fibers per Liter.

reporting will be established through these guidelines, and that States will use the best information available to them for the 1996 report.

5.4.2 Data Source: Ambient (Source) Water Monitoring

Ambient (source) water monitoring data (for drinking water contaminants addressed in State WQS and Table 5-5) should be representative of the portion of the waterbody used as a source for public water systems. EPA has considered a number of ways of determining spatial and temporal boundaries on the appropriate use of ambient monitoring data in assessing designated use support. At present, however, no method has been identified that could best serve the diverse conditions across the Nation's waterbodies. Therefore, States are requested to rely on best professional judgment in determining whether ambient monitoring data are representative of the portion of source water used as a source for drinking water. The following scenarios may provide some guidance to States in determining the appropriate use of source water data in drinking water use assessments.

Spatial Considerations - The proximity of an ambient monitoring station to a public water system intake should be considered. Ideally, raw source water quality information derived at or near the intake should be used to assess the source water support of drinking water use. Because these data may not be readily available, States are asked to consider the nearest (to the intake) raw water monitoring data, provided that these data are near enough to be considered as representative of the water quality at the intake. The best professional judgment of State water quality experts should be considered in evaluating the applicability of ambient monitoring data to drinking water use assessments. For example, data from a sampling station located some distance downstream of a drinking water intake may not support inferences concerning water quality conditions at the intake.

Temporal Considerations - Historically, States have used the past 5 years of monitoring data in assessing ambient surface water quality for designated use support. Given the frequency of monitoring at ambient stations (typically on a 3-year or 5-year cycle), States are asked to continue to use the past 5 years of monitoring data in drinking water use assessments, provided that no significant changes in water quality have occurred over the 5-year period. If significant changes in water quality have occurred during the 5-year time frame, best professional judgment of State water quality experts should be considered in evaluating the drinking water use of the source water, focusing on the 2-year period specifically covered by the 305(b) report.

If State ambient monitoring data have been incorporated into STORET/WBS, then States should use that format as the basis for drinking water use support assessments. In the past, States have evaluated drinking water use support for toxicants based on whether the mean or median value for any one contaminant (over a 5-year period) exceeds an established ambient drinking water criterion. For 1996, EPA encourages States to use the **median** value obtained for most contaminants in assessing ambient (source) water monitoring data for drinking water use support. State WQSs for some contaminants (e.g., pesticides and other seasonal contaminants) are based on annual averages. For these contaminants, the **mean** should be used rather than the median value.

5.4.3 Data Source: PWS Compliance (Finished Water) Monitoring

Information on finished water quality (concerning contaminants addressed under State WQS) should be considered when

- Ambient monitoring data show exceedance(s) for one or more contaminants, or

- Ambient monitoring data are not available for more than a few drinking water contaminants or are inadequate in characterizing the water quality of the waterbody.

Finished water monitoring data should only be used as a surrogate measure of source water quality if the distinct source water can be identified (i.e., excluding mixed systems). EPA anticipates that States may obtain the data on finished water quality from the monitoring required of PWSs under SDWA regulations. Results from the first round of this monitoring for 65 of the 84 regulated contaminants should be completed by December 31, 1995. States that are unable to access finished water quality monitoring data for their 1996 305(b) reports should use the best information available on finished water quality and plan to access the needed information for their next 305(b) reports.

States should consider those 84 contaminants regulated under the SDWA that are source-water-related in assessing drinking water support of waterbodies. Those contaminants that are known to be used or potentially present in the basin or watershed should be considered in the drinking water use assessment. Only those contaminants that are attributable to source water quality need be considered in the assessment. For example, contamination from lead and copper should only be considered in the waterbody assessment if the presence of these contaminants can be attributed to the source water. Contaminants attributable to treatment or distribution systems should be excluded.[1]

[1] Note that TTHMs and other disinfection byproducts are affected by ambient levels of total organic carbon. Also, microbiological contaminant levels in ambient water should be assessed for unfiltered systems that meet the SWTR avoidance criteria.

5.4.4 Data Source: Contamination-Based Drinking Water Use Restrictions

Use restrictions included in Table 5-6 are

- Closures of source waters that are used for drinking water supply
- Contamination-based drinking water supply advisories lasting more than 30 days per year
- PWSs requiring more than conventional treatment[2] due to suspected raw water quality problems
- PWSs requiring increased monitoring[3] due to confirmed detections of one or more contaminants (excluding cases with minimum detection limit issues).

States are asked to consider any known instances of source water closures or use advisories. Data on PWSs requiring more than conventional treatment, and PWSs requiring increased monitoring are collected under SDWA regulations and may be available through the State PWS supervision program.

5.4.5 Assessment of Drinking Water Use Support for Waterbodies

EPA requests that States use information on ambient water quality, finished water quality, and use restrictions for each drinking water contaminant assessed to determine the use support for each assessed waterbody. For waterbodies that are threatened, partially supporting, or do not support drinking water use, States should identify the contaminants that have caused the limited support or nonsupport status. States should consider the assessment framework in Table 5-6 in assessing drinking water use support.

[2] Conventional treatment is defined here to be coagulation, sedimentation, disinfection, and conventional filtration. Treatment beyond conventional levels, in response to suspected contamination, may be an indication that source water may not be fully supporting drinking water use. Note that some contaminants sorb to sediment or co-precipitate with coagulants and are removed by conventional treatment. Detection of those contaminants in source water may not reflect on drinking water support of the waterbody (since they are removed by conventional treatment).

[3] Although, strictly speaking, increased monitoring in response to contaminant detection(s) is not a use restriction, it may be an indication that source water may not fully support drinking water use.

Table 5-6. Assessment Framework for Drinking Water Use Support

Source Water Monitoring		Finished Water Monitoring[1, 2]		Restrictions		Characterization
No contaminants where the median[3] concentration exceeds the State WQS	→	No contaminants with confirmed exceedance(s) of NPDWR or No finished water data	→	No restrictions (i.e., no source water closures or advisories, no waters requiring more than conventional treatment to enable drinking water use)	→	Full Support
No contaminants where the median concentration exceeds the State WQS	→	No contaminants confirmed exceedance(s) of NPDWR or No finished water data	→	Increased monitoring imposed on PWSs supplied by the waterbody[4] or Potential for water quality degradation by contaminants that are known to be used or present in the watershed or basin	→	Full Support but Threatened
No contaminants where the median concentration exceeds the State WQS	→	No contaminants violating the NPDWR or No finished water data	→	One or more drinking water source advisories lasting greater than 30 days per year or PWSs supplied by the waterbody require more than conventional treatment due to contaminants concentrations in source water that may adversely affect treatment costs or the quality of finished water (e.g., due to taste, odor, turbidity, dissolved solids, etc.)	→	Partial Support
One or more contaminants where the median concentration exceeds the State WQS	→	One or more contaminants violating the NPDWR or No finished water data	→	One or more contamination-based closures of a drinking water source	→	Nonsupport
Source water quality and finished water quality are unknown for drinking water contaminants that are known to be used or present in the watershed or basin.				→		Unassessed

1 In past reporting cycles, only a small percentage of waters have been assessed for drinking water use. Where possible, this assessment is best accomplished using source water monitoring data. To broaden the number of assessed waters, EPA is recommending the use of finished water monitoring data to supplement source water monitoring. In the absence of finished water monitoring data, however, States should assess waters using source water monitoring and use restrictions information.

2 Excluding contaminants derived from conventional treatment (e.g., coagulation, sedimentation, disinfection, and conventional filtration).

3 If the State WQS for a contaminant (e.g., pesticides, seasonal contaminants) is based on an annual average concentration, the mean should be used rather than the median.

4 Due to previous detections of contaminants that triggered an increased monitoring frequency.

SECTION 6

1996 305(b) CONTENTS — PARTS I AND II: SUMMARY AND BACKGROUND

The Clean Water Act requires that the States transmit their water quality assessments (Section 305(b) reports) biennially to the EPA Administrator. The next reports are due by April 1, 1996, **along with WBS files or equivalent State data files.** States should provide draft reports to their EPA Regional Offices for review and comment no later than February 1, 1996. EPA requests that the States submit five (5) copies of their final reports to

Barry Burgan
National 305(b) Coordinator
Assessment and Watershed Protection Division (4503F)
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460.

The EPA Regional Office may require additional copies.

These *Guidelines* describe the baseline of water quality information required for the Section 305(b) report; however, each State may expand on this baseline where it sees fit or as agreed upon between the State and EPA Region. If a State has no information on a given measure or topic, the report should clearly indicate that this is the case. Appendixes may be used to supplement the report with information considered too detailed for general reading.

Each State's assessment should be based on the most recent water quality data available. However, coverage should not be restricted to only those waters assessed in the 1994-95 reporting period. In order to produce a comprehensive portrayal of the State's water quality, the assessment should include all waters for which the State has accurate current information. States should collect and evaluate data from all available sources, including State fish and game agencies, health departments, dischargers, and Federal agencies. Assessments should reflect rotating basin surveys and basinwide planning over the last planning cycle, which is typically 5 years for States using that approach.

States should involve designated management agencies for nonpoint source control programs in assessments for their respective source categories and affected waterbodies. EPA further encourages States to increase the involvement of Federal agencies in conducting assessments of waters on Federal lands.

The Section 305(b) report may be used to satisfy a State's reporting requirements under Section 303(d), promulgated July 24, 1992. If a State wishes to use the Section 305(b) report to transmit Section 303(d) information, the report must be received by EPA on time (by April 1, 1996). Section 303(d) information may be transmitted under separate cover. EPA will compile this information into the national 305(b) Report to Congress. See Section 7, Part III/Chapter 1 of these Guidelines for further information on Section 303(d) reporting.

Reporting requirements that can be met through the 305(b) report are listed in Table 6-1.

If the 305(b) report is not used to report information under Sections 303(d) and 319, data should be compatible and in agreement among the separate reports. If inconsistencies occur, States should explain them in a cover letter to EPA Headquarters and the Regional Office.

States can use the WBS to manage the waterbody-specific, quantitative information concerning surface water quality and sources of pollution. WBS can track 303(d)/total maximum daily loads (TMDL) lists as well as 305(b) assessments. States should transmit their WBS datasets or other waterbody-specific datasets in electronic form to the National and Regional WBS Coordinators. As in previous reporting cycles, EPA will continue to provide States with technical assistance in implementing the WBS. A *WBS96 Users Guide* is also available to assist users in the operation of the WBS. For more information, contact Regional WBS Coordinators or Jack Clifford, National WBS Coordinator, at (202) 260-3667.

Table 6-1. Reporting Requirements Satisfied by 305(b) Reports

CWA Section	Requirement
106	Requires States to report on the quality of navigable waters and, to the extent practicable, ground water in 305(b) reports as a condition of receiving 106(e) grants for water quality monitoring programs. 106 monitoring guidelines include reporting elements for ground water, wetlands, and estuaries (see Appendix E). Therefore, the 305(b) report is a convenient mechanism for reporting on programs such as: • The National Estuary Program (CWA Section 320) • Ground water protection programs • Wetlands programs
303(d)	States must report biennially lists of waterbodies needing total maximum daily loads (TMDLs)--i.e., waters not expected to achieve water quality standards after the implementation of technology-based controls. A State may submit 303(d) lists in its 305(b) report or under separate cover.
305(b)	Biennial reporting on the status of surface and ground water quality statewide; subject of these *Guidelines*.
314	State assessment of status and trends of significant publicly owned lakes including extent of point source and nonpoint source impacts due to toxics, conventional pollutants, and acidification; must report through 305(b).
319	One-time assessment of the types and extent of nonpoint source (NPS) pollution statewide; for those States that have committed to update their 319 assessments (e.g., due to grant conditions), the 305(b) report is a convenient place for such an update.

305(b) CONTENTS — PART I: EXECUTIVE SUMMARY/OVERVIEW

Each State should provide a comprehensive, concise executive summary/overview. For both surface and ground water, it should

- Describe overall State water quality (for surface water, include a summary of the degree of designated use support for the different waterbody types)
- Describe the causes and sources of water quality impairments
- Discuss the programs to correct impairments
- Discuss the general changes or trends in water quality
- Briefly recap the highlights of each section of the report, particularly the State's monitoring programs, the objectives of the State water management program, issues of special concern to the State, and any State initiatives or innovations in monitoring and assessment such as expanded use of biological indicators or biocriteria or a shift to statewide basin management.

For surface water, include a summary map or maps of designated use support and/or impairment for aquatic life, drinking water, and other uses; if this information is too detailed for a State-level map, include basin-level maps in Part III, Chapter 2.

1996 305(b) CONTENTS — PART II: BACKGROUND

To put the report into perspective for the reader, States should provide a brief resource overview, as shown in Table 6-2. States may choose to add categories to the atlas table to reflect special areas of interest (e.g., acres of playas; acres of riparian areas outside of wetlands; miles of streams and acres of lakes on Tribal lands).

Table 6-2. Atlas

Topic	Value
State population	
State surface area	
Total miles of rivers and streams[a] - Miles of perennial rivers/streams (subset)[a] - Miles of intermittent (nonperennial) streams (subset)[a] - Miles of ditches and canals (subset)[a] - Border miles of shared rivers/streams (subset)[a]	
Number of lakes/reservoirs/ponds[a]	
Number of significant publicly owned lakes/reservoirs/ponds (subset)	
Acres of lakes/reservoirs/ponds[a]	
Acres of significant publicly owned lakes/reservoirs/ponds (subset)	
Square miles of estuaries/harbors/bays	
Miles of ocean coast[a]	
Miles of Great Lakes shore[a]	
Acres of freshwater wetlands	
Acres of tidal wetlands	

[a]Available from EPA RF3/DLG estimates.

NOTE: Impoundments should be classified according to their hydrologic behavior, either as stream channel miles under rivers or as total surface acreage under lakes/reservoirs/ponds, but **not** under both categories. In general, impoundments should be reported as lakes/reservoirs/ponds unless they are run-of-river impoundments with very short retention times.

Total Waters

The State/EPA 305(b) Consistency Workgroup has agreed that the best estimates of total State waters available nationwide are obtained using the EPA River Reach File Version 3.0 (RF3). RF3 is derived from the U.S. Geological Survey (USGS) 1:100,000 scale Digital Line Graph (DLG) data, which contain all hydrologic features found on the same scale USGS paper maps.

EPA has used RF3 to develop estimates of total waters, by State, as follows: total river miles, with breakdowns for perennial streams, intermittent streams, ditches and canals, and border rivers; total lake acres; number of lakes; total ocean coastal miles; and total Great Lakes shore miles. These breakdowns were produced using the USGS DLG codes to differentiate between types of hydrologic features. These estimates, which have not changed since the 1994 305(b) cycle, are available on diskette from Barry Burgan, the National 305(b) Coordinator, at (202) 260-7060.

EPA will be citing the RF3/DLG estimates of total waters (i.e., total river miles, lake acres, ocean coastal miles, and Great Lakes shore miles) in its 1996 305(b) *Report to Congress*, and urges States to use them in their State water quality assessments. EPA, in consultation with individual States and USGS, will continue to refine these estimates where appropriate. States using maps and measurement techniques of higher resolution than those on which the RF3/DLG estimates are based may choose to report their own estimates, with appropriate explanation in the text of their reports. For example, due to limitations of the DLG data underlying EPA's Total Waters estimates, States may have more accurate estimates of ocean coastal miles and Great Lake shore miles.

EPA recognizes that variation in cartographic density exists among the maps used to create the DLG, and, therefore, the RF3-based total water numbers also reflect these variations. Also, RF3 is a new database and users may identify needed corrections. States and other users are urged to participate in updating and correcting RF3 in the future. RF3 data and documentation can be obtained from EPA by contacting STORET User Assistance at (800) 424-9067. Other RF3-related questions should be directed to Tommy Dewald, EPA Office of Wetlands, Oceans, and Watersheds, at (202) 260-2488.

Until improved approaches are available to determine total estuarine and wetlands waters, States should continue to use the best available methods and should identify those methods. The U.S. Fish and Wildlife Service National Wetlands Inventory is recommended for State wetland acreage estimates.

Maps

States should include maps and other graphical depictions of background information relevant to water quality assessments. For the 1996 cycle, the 305(b) report should include maps of basins or watersheds used in rotating basin surveys or statewide basin management, ecoregions, physiogeographic provinces, Tribal lands, and other significant characteristics of the State. [Note: In Section 7, Surface Water Assessment, the Guidelines request maps showing degree of use support of waterbodies.]

Water Pollution Control Program

Each State should provide an overview of its approach to water quality management.

Watershed Approach

Include an overview of any watershed- or basin-oriented programs, such as the statewide basin management approach involving rotating basins used by many States and strongly supported by EPA. Describe the manner in which monitoring and point and nonpoint source control programs are implemented within this watershed approach. Also, describe how 305(b) reporting fits in with these programs, including the extent to which assessment information developed for basin management plans is compatible with or can be transferred directly to the 305(b) reporting process.

Water Quality Standards Program

Provide an overview of the Standards program, including the extent to which the State establishes designated uses for their rivers, lakes, and estuarine/coastal waters consistent with the goals of the Clean Water Act. States should also explain what kinds of waters are not classified as to designated use and how they determine which waters should be classified. Last, the 305(b) report should include a brief discussion of changes in water quality standards that have occurred since the previous report, including progress toward implementing biocriteria.

EPA asks States to provide a list of the State ambient WQSs that are used to assess drinking water use attainment and to compare these WQSs to the list of National Primary Drinking Water Regulations contaminants. This information should be included as an appendix to the State 305(b) report.

Point Source Program

Within the context of both technology-based and water-quality-based controls, States should provide a **general overview** of the point source control program. They should focus on program actions, their relationship to water quality, and their effectiveness in improving water quality. In particular, State programs to assess and control the discharge of toxic pollutants should be discussed.

EPA will use information available through the Permit Compliance System (PCS) to summarize national progress. EPA encourages the States to provide additional quantitative information if they choose.

Nonpoint Source Control Program

Section 319 of the Clean Water Act, as amended by the Water Quality Act of 1987, required States to conduct an assessment of their nonpoint source (NPS) pollution problems and submit that assessment to EPA. In this chapter, the State is asked to update its Section 319(a) assessment report and discuss highlights of its nonpoint source management programs, including NPS priority watersheds. Updated waterbody-specific information on Section 319 waters should be included in the WBS. In addition, if a State provides a hard-copy list of its Section 319 waters, it should do so here or in a clearly identified appendix.

Program highlights to be reported in this chapter should include both activities funded under Section 319 and nonpoint source activities funded from other Federal, State, or local sources. Highlights may include, but are not limited to, results of special nonpoint source projects, new State legislation for nonpoint source control, Section 319 ground water activities, an analysis of the change in water quality due to implementation of NPS controls, and innovative activities begun/completed since the last 305(b) reporting cycle (e.g., intergovernmental initiatives, watershed targeting, point source/nonpoint source trading).

In addition, States may refer to several other sources that will help them in reporting on nonpoint sources. The *Nonpoint Source Guidance* (December 1987) describes annual reporting for the Section 319 Management Program, which is not included in the 305(b) reporting process.

Section 6217 of the Coastal Zone Reauthorization Amendments of 1990 requires each State with a federally approved coastal zone management program to develop a coastal nonpoint program to restore and protect coastal waters. States must implement management measures in conformity with guidance issued by EPA and NOAA to protect coastal waters. This guidance, *Technical Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*, describes management measures that States are to achieve or implement throughout their coastal zones.

Section 6217 also requires that States develop additional management measures to address more localized problems resulting from particular land uses or to manage critical coastal areas adjacent to impaired or threatened waters. These additional management measures are to be implemented in combination with the basic management measures specified in the technical guidance. In order to meet these requirements, States should emphasize water quality assessments and reporting under Section 305(b) for coastal waters, identifying threatened and impaired waterbodies for which additional management measures will be applied. EPA and NOAA have prepared a separate guidance document, *Coastal Nonpoint Pollution Control Program. Development and Approval Guidance* (U.S. EPA and NOAA, 1993), which describes how and when States are to develop programs to implement these management measures. Contact the Nonpoint Source Branch, EPA Assessment and Watershed Protection Division, (202) 260-7085, for a copy. In their 305(b) reports, coastal States should report on progress under Section 6217, including agencies and their responsibilities, management measures planned or implemented, and strategy for the next 2 years.

Coordination with Other Agencies

Provide a description and/or table of program coordination with other State, Tribal, and local agencies. Mention any formal agreements such as memoranda of agreement or understanding, interagency or interstate agreements, or other agreements regarding watersheds or waterbodies. Also discuss any informal arrangements (e.g., related to monitoring or enforcement).

Cost/Benefit Assessment

Section 305 requires the States to report on the economic and social costs and benefits of actions necessary to achieve the objective of the Clean Water Act. It is recognized that this information may not be readily available due to the complexities of the economic analysis involved. However, until such time that procedures for evaluating costs and benefits are in wider use and have become available, States should provide as much of the following information as possible.

Cost Information

EPA asks States to provide as much of the following information as possible. Some possible sources of information are included in the box on page 6-11.

- Capital investments in municipal facilities in the past 2 years, 10 years, and since 1972
- Capital investments in industrial facilities in the past 2 years, 10 years, and since 1972
- Investments in nonpoint source measures in the past 2 years, 10 years, and since 1972

- Annual operation and maintenance costs of municipal facilities
- Annual operation and maintenance costs of industrial facilities
- Total annual costs of municipal and industrial facilities
- Annual costs to States and local governments to administer water pollution control activities.

Benefits Information

The economic benefits that result from improvements in water quality are those effects that improve the economic well-being of individuals or firms. Individuals can benefit from enhanced recreation opportunities and aesthetics and from the knowledge that the aquatic ecosystem is being protected perhaps for future generations. As a result of water quality improvements, people may visit different water sites than they used to, or they may recreate near water often. Firms may gain from cleaner water by having lower water treatment costs or perhaps by having lower wage bills due to the higher quality of life that their location has to offer.

Methods of quantifying economic benefits are described briefly in U.S. EPA (1991) and theory and methods are detailed in Freeman (1993). To facilitate comparisons between the costs and benefits of efforts to improve or protect water quality, it is desirable to measure both in dollar units. However, this is not always feasible or cost-effective. Nonetheless, it may be prudent to quantify benefits in nonmonetary terms or to provide qualitative descriptions of the water quality improvements and the associated effects of those improvements. To aid in this regard, the State may attempt to document how people and firms are using the waters in the State. Information on recreation participation rates (see list on page 6-12) is useful in and of itself. EPA is in the process of collecting data on water-based recreation activities (i.e., fishing, swimming, boating, and near-shore) using a random sample of the national population. These data will be used to estimate participation rates at the State level in reports that EPA will publish in 1996. States may have easy access to information on participation for those activities that require licenses or entrance fees. States may also be in a position to tabulate the number of industrial units, thermoelectric facilities, and farms that divert water for productive purposes. Some localities may also have data demonstrating the importance of shoreline properties to the local tax base. Some regions may have lower average salaries for highly trained professionals that can be attributed to a higher quality of life due to abundant environmental amenities.

Such participation, water use, and quality of life information aids in documenting the importance of water resources. However, to estimate the economic benefits of water quality improvements, it must first and foremost

Sources of Cost Information

After issuance of these Guidelines, the EPA Regions will provide information to State 305(b) Coordinators from the Federal government sources cited below. Two annual Census Bureau surveys provide information on State spending on water quality which could be used to supplement information available from the States themselves. The Census Bureau conducts an Annual Survey of Government Finances and an annual Survey of Pollution Abatement Costs and Expenditures (PACE), and publishes the results of each (*Government Finances: 1990-91*, Series GF/91-5; *Current Industrial Reports*, MA 200, "PACE," through the U.S. Government Printing Office, Washington, DC). To obtain a copy of each report, telephone (301) 457-4100. Possible sources on State water quality expenditures from these documents include:

Capital investments and annual O&M expenditures at municipal facilities —

Government Finances report, Table 27: "Finances of Utilities Operated by State and Local Governments by State, Type of Utility, and Government" — This table indicates (by State) the expenditures by government utilities for water supply, and breaks down operating costs and capital costs.

Government Finances report, Table 29: "State and Local Government Revenue and Expenditure by Level and Type of Government, by State — This table indicates total expenditures by State and local governments on sewerage (with capital outlay separated) and solid waste management.

Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations — Report to Congress (EPA 810-R-93-001, September 1993).

State sources: State water quality agencies, revolving fund program

Capital investments and O&M expenditures at industrial facilities —

PACE report, Table 6b: "Capital Expenditures by States for Media Water" — This table indicates (by State) total capital expenditures for water pollution abatement by manufacturing establishments, and breaks expenditures down by type of pollutant abated (hazardous vs. nonhazardous) as well as abatement technique (end of line vs. production process enhancements)

PACE report, Table 10b: "Operating Costs by States for Media Water" — This table indicates (by State) total operating costs for water pollution abatement by manufacturing establishments, and breaks down costs by type of pollutant abated (hazardous vs. nonhazardous). Nonhazardous costs are further broken down (payments to industry vs. sewage services payments to government).

For nonmanufacturing sectors (mining, petroleum and electric utilities), information is not broken down by State in the PACE report.

Nonpoint source investments — State NPS program, other State water quality agencies

Administrative Costs — State budget office.

be documented that water quality has in fact been improved or that degradation in water quality has been prevented as a result of investments in protection and enhancement. States may vary quite a bit in the type of data that they collect to verify the quality of their waters. The common requirement for an economic benefit assessment is the ability to demonstrate how the changes in water quality result in changes in how humans and business enterprises use and enjoy the water resources.

Access to information on existing studies of the benefits of water quality improvements may soon be facilitated by an EPA Bulletin Board. States may also find well-qualified academics who are willing to answer questions related to the information needs for, and feasibility of, conducting an economic benefit assessment. The Association of Environmental and Resource Economists maintains a directory of its members, including their main fields of study. A large percentage of the membership has experience in valuation. This list can be obtained from Resources for the Future, 1616 P Street, NW, Washington, DC 20036.

States should provide the following information about benefits to the extent possible:

- Improvements in recreational fishing
- Improvements in commercial fishing (catch rate, etc.)
- Number of stream miles, lake acres, etc., improved from impaired to fully supporting in the past 10 years
- Reduced cost of drinking water treatment due to cleaner intake water
- Increase in use of beaches attributed to improved water quality
- Increase in recreational boating attributed to improved water quality.

States should also report case studies of water quality improvement due to point and nonpoint source controls or habitat restoration and cases of impairment prevented by controls or habitat protection. In the absence of extensive cost/benefit studies, case studies of specific waterbodies can make a compelling argument for the value of water quality management actions.

Case studies might include instances where expenditures resulted in increased water-based recreational activities, improvements in commercial fisheries, recovery of damaged aquatic environments, or reduced costs of water treatment undertaken at municipal and industrial facilities. States should also discuss the costs and benefits of water quality achievements for programs or specific sites documented elsewhere in the report. Examples of such projects include Clean Lakes restorations and nonpoint source control projects.

Special State Concerns and Recommendations

This section should consist of two parts. First, States should discuss special concerns that are significant issues within the State and that affect its water quality program. List and discuss any special concerns that are not specifically addressed elsewhere in this guidance, or, if they are addressed, are not identified as special State concerns. This section is a key part of the assessment, describing the forces driving specific State programs and illustrating the complex and varying nature of water quality problems throughout the country. Include, if possible, the strategies that are being planned or implemented to alleviate these problems and give site-specific examples.

Second, provide recommendations as to additional general actions that are necessary to achieve the objective of the Clean Water Act: providing for the protection and propagation of shellfish, fish, and wildlife and allowing recreation in and on the water. Examples of recommendations include developing more FDA action levels, improving training of municipal treatment facility operators, correcting combined sewer overflows, placing more emphasis on the identification and control of nonpoint sources, point source/nonpoint source trading, statewide basin management, and other watershed-based water quality management programs.

SECTION 7

1996 305(b) CONTENTS — PART III: SURFACE WATER ASSESSMENT

Chapter One: Surface Water Monitoring Program

To provide a perspective on their activities to evaluate water quality, States should describe their monitoring programs and briefly discuss any changes in program emphasis that are planned or have taken place since the last report. Of particular interest this cycle are any changes resulting from a shift to basinwide or watershed planning, rotating basin surveys, or probability-based monitoring.

The description of State monitoring programs should include the basic program components that follow, with references to other documents including approved quality assurance program plans. The following are consistent with Monitoring Program Workplan elements in Section 106 Grant Guidance to the States (Appendix E) as well as with the ITFM framework for water quality monitoring. States could extract information from their 106 workplans to prepare this section of the 305(b) report.

- Purpose of monitoring program
    - goals
    - use of data quality objectives
    - geographic areas targeting for monitoring
    - environmental indicators
    - use of reference conditions
- Coordination/collaboration
    - other agencies or groups with similar monitoring goals or information
    - how such information is used
- Design
    - timelines to accomplish monitoring program objectives
    - sampling approaches (biological, habitat, physical, chemical, toxicological)

  - data collection methods
  - water quality problems and data gaps

- Networks and Programs (include objectives, number of sites, sampling frequency, parameters)
  - Fixed-station networks
  - Intensive surveys including rotating basin surveys
  - Targeted areas under watershed programs, other programs, and multiple programs
  - Toxics monitoring programs
  - Biological monitoring programs
  - Fish tissue, sediment, and shellfish monitoring programs.

- Laboratory analytical support
  - Laboratories used
  - Issues (e.g., capacity, methods)

- Quality assurance/quality control program (brief description)

- Approach for data storage, management and sharing

- Training and support for volunteer monitoring

- Data interpretation and communication
  - status of the State's WBS or equivalent system
  - status of georeferencing waterbodies to WBS
  - efforts to make reports accessible

- Program evaluation
  - updates of monitoring strategy and QA plans
  - brief assessment of effectiveness of the monitoring program in providing data to meet program objectives
  - changes needed to evaluate new problems

States should include maps of fixed-station monitoring sites and other key monitoring sites and networks. These may be river basin maps from basin management plans or reports.

Finally, States should discuss any plans to use data generated by EPA's Environmental Monitoring and Assessment Program (EMAP), USGS's NAWQA program, or NOAA's Status and Trends Program and should identify any monitoring and/or data management tools needed to improve their ability to assess the quality of their waters and to increase the percentage of waters assessed. Examples of such needs are new monitoring protocols, data systems, or specific training.

Chapter Two: Assessment Methodology and Summary Data

Assessment Methodology

States should provide information on the methods they used to assess data for determining use support status. This documentation should include types of information used, data sources, assessment confidence levels, and identification of organizational units that make use support determinations. The decision process for assigning waterbodies to different use support categories (fully supporting, partially supporting, etc.) should be explained in detail. The use of flow charts of the decision process is recommended. Appendix F includes examples of assessment methodologies with the appropriate level of detail. States not using the WBS should describe the databases they use to track and report assessments and work with EPA to provide the data in WBS-compatible format.

States should highlight changes in assessment methodology since the last 305(b) assessment. States should also explain any biases incorporated into their assessments (e.g., monitoring concentrated around areas of known contamination; small percentage of waters assessed; limited monitoring of waterbodies affected by nonpoint sources). Also for 1996, EPA asks States to discuss how they determine the extent of a waterbody represented by a single assessment or monitoring site (see also Section 4.1).

Several States have adopted a statewide basin management approach in which they assess all basins or watersheds at regular intervals (typically 5 years). EPA encourages this approach and requests that States report the status of their efforts and any special considerations in making assessments using rotating basin data. A State using rotating basin surveys as part of a statewide basin management approach should report the number of years required to assess all basins (i.e., the entire State) and the percentage of total State waters actually assessed during this cycle. States should also report basinwide plans by name and year completed or expected to be completed.

EPA views a 4- to 6- year cycle as a reasonable timeframe, i.e., some professional review of available information for each waterbody should occur at least every 4 to 6 years as negotiated with the EPA Region. Waterbodies that have not actually been assessed for more than 6 years should generally not be reported as assessed. EPA recognizes that monitoring intermittent streams is not possible in many parts of the country due to resource constraints and lack of monitoring methods. To achieve the 4- to 6-year coverage, a State could assess a statistically valid subset of all perennial streams and intermittent streams and infer the condition of the whole. See Section 4.2 of these Guidelines for more information about probability-based and targeted monitoring.

Finally, if water quality trends are reported, the State should include a description of its methods and software.

Maps

EPA and the 305(b) Consistency Workgroup are committed to improving the usefulness of water quality data through spatial analysis. For example, maps displaying designated use support information for rivers, lakes, estuaries, oceans, Great Lakes, and wetlands are very useful in showing the extent of impairment of designated uses. Maps can also illustrate the distribution of waters impaired by specific sources or causes, as well as the locations of monitoring sites, dischargers, land-disturbing activities, and threatened wetlands.

States with GISs can generate such maps by georeferencing their waterbody-specific assessment data (e.g., WBS data) to the River Reach File Version 3 (RF3). To do this, the State assigns locational coordinates to each waterbody. RF3 is EPA's national hydrologic database; RF3 allows georeferenced data to be displayed spatially and overlaid with other data in a GIS. EPA is providing technical support for this process to States that use WBS. Example outputs are being provided to State 305(b) Coordinators.

To move toward greater use of spatial analysis, the 305(b) Workgroup made the following recommendations:

- EPA should continue to encourage States to georeference their waterbodies to RF3 and provide technical support for this effort.
- Each State should have a base-level computer system to implement software such as Arc/Info, ArcView, and the PC Reach File.
- Each State should seek technical input from EPA before reach indexing to ensure Regional and national compatibility.

For technical details about each of the above items, contact John Clifford of the EPA Office of Water at (202) 260-3667.

EPA recognizes that some State 305(b) programs will not have access to a GIS for the 1996 cycle; these States are asked to provide maps in whatever form they commonly use for other documents. For example, each State has base maps of hydrography that can be used to prepare use support maps. Using waterbody-specific assessment data from WBS or other systems, States should prepare maps showing degree of use support for each use (aquatic life, drinking water, etc.). Similar maps should display the major causes and sources of impairment. These maps can be at the State level or basin scale. Basin-scale maps may be available from basin plans under a statewide basin management approach.

Section 303(d) Waters

States are expected to use existing and readily available information to determine which waterbodies should be on the Section 303(d) list. A number of sources can be used to assist in making this determination, including the 305(b) report. A deliberative analysis of existing information, involving best professional judgment, should be conducted to evaluate if the information is adequate to support inclusion of a waterbody on the Section 303(d) list.

Section 303(d) of the CWA requires States to identify and establish a priority ranking for waters that do not or are not expected to achieve or maintain water quality standards with existing or anticipated required controls. States are required to establish TMDLs for such waters in accordance with such priority ranking. If States fails to do so, EPA is required to identify waters and assign a priority ranking for TMDL development. EPA encourages States to include the prioritized list of waters requiring TMDLs in their 305(b) reports and to utilize the WBS for this purpose.

By regulation, EPA requires that States submit their information pursuant to Section 303(d) by April 1, 1996. This requirement includes completion of the 303(d) list and public review. The actual list submission can be part of the 305(b) report or a separate document. Amendments to the relevant regulations were promulgated July 24, 1992 (57 *Federal Register* 33040). Detailed technical and program guidance describing State and EPA responsibilities pursuant to Section 303(d) can be found in *Guidance for Water Quality-Based Decisions: The TMDL Process,* EPA 440/4-91-001, published in April 1991; in the memorandum from Geoffrey H. Grubbs "Supplemental Guidance on Section 303(d) Implementation" dated August 13, 1992; and in Mr. Grubbs' memorandum "Guidance for 1994 Section 303(d) Lists" dated November 26, 1993. The November 26, 1993, memorandum is included in Appendix E of these 305(b) Guidelines and contains specific guidance about which waterbodies to include in a Section

303(d) list. For more information contact Mimi Dannel of the EPA Watershed Branch at (202) 260-1897.

States must transmit their Section 303(d) lists to EPA by April 1, 1996, even if the 305(b) report is not yet ready for transmittal on that date. If necessary, the list can be revised following finalization of the 305(b) report.

States are requested to list their 303(d) waterbodies in Table 7-1 or a similar format. To simplify their reporting requirements, States can use WBS to track and report this information. WBS contains a special 303(d) list module with cause and source codes and other fields appropriate to tracking TMDLs. EPA's 303(d) program considers WBS to be the primary reporting system for waters needing TMDLs. If a State wishes to transmit 303(d) information via the 305(b) report, however, the submittal must meet the 303(d) requirements and deadlines as described below. EPA is currently exploring ways in which to consolidate a number of CWA reporting and assessment requirements and is beginning to develop this consolidated approach now.

Using the data from Table 7-1, the WBS, and other sources, States should also provide the following summary information. An asterisk denotes information required by regulation.

- Methodology used to develop the TMDL list*
- Database used to develop the TMDL list*
- Rationale for any decision not to use existing and readily available data*
- Total number of water quality-limited (WQL) waterbodies requiring TMDLs (may be fewer than the number of WQL waterbodies, see Section 303(d) guidance)
- Status of TMDLs targeted during the last cycle (April 1994 - April 1996).

Chapter Three: Rivers and Streams Water Quality Assessment

Designated Use Support

States should report summaries of designated use support in rivers and streams in two tables: one table summarizing the extent of impairment (Table 7-2) and another listing individual designated uses (Table 7-3).

The 1996 305(b) Consistency Workgroup recommended that overall use support no longer be a reporting requirement, as it masks the specific number of uses impaired. To retain summary information on the total condition and size of waters assessed, States should report the information in Table 7-2 for rivers and streams.

Table 7-1. State 303(d) List of Waters Needing TMDLs

WBID	WB Name* and Description	Size of WB Affected	Specific Pollutant or Stressor*	Probable Source(s) of Pollutant	Priority for TMDL (H/M/L)*	Targeted for TMDL* (Yes/No)	No. of NPDES Permit Renewals 4/96-4/98	No. of NPS Projects in Watershed

*Information required by regulation.

WB = Waterbody
H/M/L = High/medium/low
Targeted = Waterbody has been identified for TMDL development during the April 1996 - April 1998 cycle.
NPDES = National Pollutant Discharge Elimination System.

WBS Users--The WBS can be used to generate Table 7-2. To do so, WBS users must fill in size fields for the generalized use support categories for each waterbody (aquatic life, fish consumption, etc.). Users must also complete the Assessment Category field in WBS to distinguish evaluated (E) from monitored (M) assessments.

Table 7-2. Summary of Fully Supporting, Threatened, and Impaired Waters

Degree of Use Support	Assessment Category		Total Assessed Size (miles)
	Evaluated[a]	Monitored[a]	
Size Fully Supporting All *Assessed* Uses			
Size Fully Supporting All *Assessed* Uses but Threatened for at Least One Use			
Size Impaired for One or More Uses			
TOTAL ASSESSED			

[a] Report size in each category (rivers and streams reported in miles).

[b] Size threatened is a distinct category of waters and is not a subset of the size fully supporting use (see Section 3.2 of these Guidelines). It should be added into the totals entered in the bottom line.

[c] Impaired = Partially or not supporting a designated use.

WBS Users--WBS can be used to generate Table 7-3. To do so, users must fill in size fields for the generalized use support categories for each waterbody (aquatic life, fish consumption, etc.)

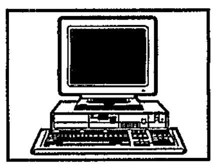


Table 7-3. Individual Use Support Summary

Type of Waterbody: Rivers and Streams

Goals[a]	Use	Size Assessed	Size Fully Supporting	Size Fully Supporting but Threatened	Size Partially Supporting	Size Not Supporting	Size Not Attainable
Protect & Enhance Ecosystems	Aquatic Life						
	State Defined 1. 2.						
Protect & Enhance Public Health	Fish Consumption						
	Shellfishing						
	Swimming						
	Secondary Contact						
	Drinking Water[b]						
	State Defined 1. 2.						
Social and Economic	Agricultural						
	Cultural or Ceremonial						
	State Defined 1. 2.						

[a] These goals are part of the national water quality goals adopted by the EPA Office of Water and the ITFM in their Environmental Goals and Indicators effort.

[b] Drinking water use support is also summarized in Tables 7-23 and 7-24.

In order for EPA to summarize data from over 56 305(b) reports, please leave no blanks in this table. Instead use the following conventions:

asterisk (*) = category not applicable
dash (-) = category applicable no data available
zero (0) = category applicable, but size of waters in the category is zero.

Table 7-3 lists specific designated uses and combines Clean Water Act goal reporting and designated use reporting into one table. The fishable goal of the Clean Water Act is reported under the Fish Consumption, Shellfishing, and Aquatic Life Support Uses, and the swimmable goal is reported under the Swimming and Secondary Contact Uses.

In order for EPA to summarize use support at a national level, States must report waterbody sizes for the generalized use categories shown in Table 7-3 (fish consumption, shellfishing, etc.). More specific State uses may be itemized in the spaces provided at the bottom of the table, but must be consolidated into the eight general use categories to the extent possible. This consolidation should be based on the most sensitive State use within a generalized use (e.g., cold water fishery would be included in aquatic life use support for a trout stream).

Special Summary for ALUS

As discussed in Section 5.1 of these Guidelines, EPA is asking States to track measures of assessment confidence for the first time in 1996. This effort is limited to ALUS for rivers and streams. EPA is not asking States to report summaries of their assessment confidence levels, but only to indicate the miles assessed using biological/habitat (B/H) data and physical/chemical (P/C) data. States should complete Table 7-4 with this information, **which will be aggregated nationally**. EPA is currently developing biological indicators as part of its national water quality indicators effort. The Agency needs specific mileage information for B/H data to compile on a national basis. Table 7-4 contains important information for this effort.

WBS is being modified to generate Table 7-4. See "Managing Use Support and Assessment Description Data" in Section 5.1.4 and also the *WBS96 Users Guide*. The information in Table 7-4 can also be generated from Assessment Type Codes if the State stores these codes in WBS or another data management system. The 1996 Guidelines strongly encourage the use of Assessment Type Codes, which are described in Table 3-1 of these Guidelines and have been expanded for 1996.

Causes and Sources of Impairment of Designated Uses

For those waters assessed that are not fully supporting their designated uses (i.e., impaired waters), States should provide the following information to illustrate the causes and sources of use impairment statewide. **States may also wish to prepare similar tabular information for waters that fully support uses but are threatened.**

Table 7-4. Categories of Data Used in ALUS Assessments for Wadable Streams and Rivers

Degree of ALUS	Miles Assessed Based on B/H Data Only[a]	Miles Assessed Based on P/C Data Only[b]	Miles Assessed Based on B/H and P/C Data[c]	Total Miles Assessed for ALUS[d]
Fully Supporting				
Fully Supporting but Threatened				
Partially Supporting				
Not Supporting				

[a]Using data types from Table 5-2 as expanded by State.
[b]Using data types from Table 5-3 as expanded by State.
[c]Using data types from both Tables 5-2 and 5-3.
[d]Total of previous 3 columns.

Relative Assessment of Causes —

Causes are those pollutants or other stressors that contribute to the actual or threatened impairment of designated uses in a waterbody. Stressors are factors or conditions (other than specific pollutants) that cause impairment (e.g., flow and other habitat alterations, presence of exotic species). In Table 7-5, States should provide the total size (in miles) of rivers and streams affected by each cause category. *A waterbody may be affected by several different causes and its size should be counted in each relevant cause category*. See Section 3 for new discussion of the terms Major/Moderate/Minor and a list of cause codes for the WBS.

The relative magnitude of causes does not necessarily correspond to degree of use support. For example, a waterbody can have three causes labeled as moderate, but have sufficient impairment from these multiple causes to be assessed as not supporting.

Most of the causes in Table 7-5 are self-explanatory but some warrant clarification:

- *Siltation* refers to the deposition of sediment on the bottom of a waterbody causing such impacts as smothering benthic habitat in streams or filling in of lakes.

Table 7-5. Total Sizes of Waters Impaired by Various Cause Categories

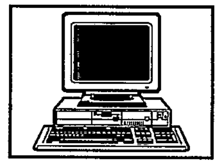
Type of Waterbody: Rivers and Streams (Reported in Miles)[a]

Cause Category	Size of Waters by Contribution to Impairment[a,b]	
	Major[c]	Moderate/Minor[c]
Cause unknown		
Unknown toxicity		
Pesticides		
Priority organics		
Nonpriority organics		
Metals		
Ammonia		
Chlorine		
Other inorganics		
Nutrients		
pH		
Siltation		
Organic enrichment/low DO		
Salinity/TDS/chlorides		
Thermal modifications		
Flow alterations		
Other habitat alterations		
Pathogen indicators		
Radiation		
Oil and grease		
Taste and odor		
Suspended solids		
Noxious aquatic plants		
Total toxics		
Turbidity		
Exotic species		
Other (specify)		

[a] Reported in total size (rivers and stream reported in miles). When preparing this table for other waterbody types, use the following units: lakes, acres; estuaries, square miles; coastal waters and Great Lakes, shore miles; wetlands, acres.

[b] In order for EPA to summarize data from over 56 305(b) reports, please leave no blanks in this table. Instead use the following conventions:
asterisk (*) = category not applicable
dash (-) = category applicable no data available
zero (0) = category applicable, but size of waters in the category is zero.

[c] Note that multiple moderate/minor causes can additively result in nonsupport. See discussion in Section 3.9 of these Guidelines.



WBS Users--WBS can generate Table 7-5 from waterbody-specific information. To do so, WBS users must complete Cause Size and Cause Magnitude fields for each waterbody. Table 3-2 lists the causes from WBS. States can also add their own codes to WBS to track additional causes. For example, some States have added codes under Code 500--Metals, to track specific metals such as mercury and copper. If a State chooses to add cause codes to WBS, the data system can still be used to generate Table 7-5. *To use the WBS to generate this table, enter a total size for each major category of causes (the categories in Table 3-2 such as 0500--Metals or 0200--Pesticides) for each waterbody.* This is necessary because there may be overlap among the subcategories of causes. For example, 5 miles of a waterbody may be impacted by copper and 7 miles by zinc, but the total size impacted by "metals" may be 10 miles due to partial overlap of the specific causes. Simple addition of the sizes impacted by the specific causes (i.e., 12 miles) would not be accurate in this case.

- *Thermal modification* generally involves the heating of receiving waters by point sources (e.g., plant cooling water) or nonpoint sources (e.g., runoff from pavement or elimination of bank shading).

- *Flow alteration* refers to frequent changes in flow or chronic reductions in flow that impact aquatic life (e.g., as flow-regulated rivers or a stream with excessive irrigation withdrawals).

- *Other habitat* alterations may include removal of woody debris or cobbles from a stream.

- *Exotic species* are introduced plants and animals (e.g., Eurasian millfoil, zebra mussels, grass carp) that interfere with natural fisheries, endangered species, or other components of the ecosystem.

Relative Assessment of Sources —

Sources are the facilities or activities that contribute pollutants or stressors, resulting in impairment of designated uses in a waterbody. Data on sources are tracked for each impaired waterbody in the State (e.g., using WBS). Appendix C lists types of information useful in determining sources of water quality impairment.

States should provide the total size (in miles) of rivers and streams affected by each category of source, including the size with overall point and nonpoint source impacts (Table 7-6). **A waterbody may be affected by several sources of pollution and the appropriate size should be counted in each relevant source category.**

Table 7-6. Total Sizes of Waters Impaired by Various Source Categories

Type of Waterbody: Rivers and Streams (reported in miles)[a]

Source Category	Contribution to Impairment[b]	
	Major[a]	Moderate/Minor[a]
Industrial Point Sources		
Municipal Point Sources		
Combined Sewer Overflows		
Agriculture		
Silviculture		
Construction		
Urban Runoff/Storm Sewers		
Resource Extraction		
Land Disposal		
Hydromodification		
Habitat Modification		
Marinas		
Atmospheric Deposition		
Contaminated Sediments[c]		
Unknown Source		
Natural Sources		
Other (specify)[d]		

[a] Reported in total size (rivers and streams reported in miles).
In order for EPA to summarize data from over 56 305(b) reports, please leave no blanks in this table. Instead use the following conventions:
- asterisk (*) = category not applicable
- dash (-) = category applicable no data available
- zero (0) = category applicable, but size of waters in the category is zero

[b] Note that multiple moderate/minor sources can additively result in nonsupport. See Section 3.9.

[c] Bottom sediments contaminated with toxic or nontoxic pollutants; includes historical contamination from sources that are no longer actively discharging. Examples of contaminants are PCBs, metals, nutrients (common in lakes with phosphorus recycling problems), and sludge deposits. Please indicate the screening levels or criteria used (e.g., EPA sediment quality criteria; NOAA effects range-medium [ER-M] values).

[d] List additional sources known to affect waters of the State.

WBS Users--WBS stores and reports on a more detailed list of source subcategories under some of the general categories such as Agriculture. The full list of source categories is given in Section 3.7.

To use the WBS to generate Table 7-6 from waterbody-specific information, users must complete Source Size and Source Magnitude fields for each waterbody. **If source subcategories or used, users must always enter a size for each appropriate general source category (such as 1000--Agriculture).** WBS cannot calculate the size of waters affected by **Agriculture** from the agriculture subcategories in Table 3-1 because the sizes of waters affected by each subcategory may overlap and not be additive. For example, consider a 15-mile waterbody with 10 miles affected by nonirrigated croplands, 5 miles affected by pastureland, but a total of 12 miles affected by the **Agriculture** general category because the two subcategories of sources overlap:

Code 1000	**Agriculture** (general category)	12 miles
Code 1100	Nonirrigated crop production	10 miles
Code 1400	Pastureland	5 miles

To be able to generate Table 7-6 using the WBS, total mileage must be entered for the general source category affecting a waterbody (i.e., for the categories in Table 7-6) whether or not source subcategories are also entered.

Table 7-6 shows the minimum level of detail regarding source categories. States are urged to include the more detailed list of subcategories, since this will increase the overall usefulness of the report and of the State's 305(b) assessment database. However, States must always provide aggregate source category totals for the source categories shown in Table 7-6. The cell entitled "Other" in Table 7-6 should actually be a list of specific additional sources not included in the preceding categories.

The Natural Sources category should be reserved for waterbodies impaired due to naturally occurring (nonanthropogenic) conditions. **See Section 3.7 for a discussion of appropriate uses of this source category.**

For technical or economic reasons, impairment by a natural source may be beyond a State's capability to correct. A use attainability analysis may demonstrate that a use is not attainable or that another use is appropriate for a waterbody.

Cause/Source Linkage —

States are asked to link causes with sources for a waterbody in their assessment databases whenever possible **(see Section 3.8).** A special cause/source link field is provided in WBS for this purpose. Linked cause/source data are very important for producing the standard 305(b) report tables and for answering State resource management questions. For example, the question "Which waterbodies are impaired due to nutrients from agricultural runoff?" cannot be answered if the cause/source link is not used.

Chapter Four: Lakes Water Quality Assessment

Summary Statistics

States should report summary statistics for use support and for causes and sources of impairment in lakes. The format should be similar to that used for rivers and streams. That is, Tables 7-3, 7-5, and 7-6 should be developed for all lakes in the State, including significant publicly owned lakes under Section 314 as well as any other lakes assessed by the State. The reporting unit for lakes in these tables is acres.

Because of national interest in the relative contribution of point sources vs. nonpoint sources, each State is also asked to report:

- Statewide total acres of lakes not fully supporting uses, with major contributions from point sources
- Statewide total acres of lakes not fully supporting uses, with major contributions from nonpoint sources.

See "Relative Assessment of Sources" in Chapter 3 for further discussion. EPA will assist WBS users in generating these numbers.

The remainder of this chapter deals with reporting requirements under Section 314. The focus is on significant publicly owned lakes, although EPA urges States to report on all lakes.

Clean Lakes Program

Section 314(a)(2) of the CWA, as amended by the Water Quality Act of 1987, requires the States to submit a biennial assessment of their lake water quality as part of their 305(b) report. The specific elements of the assessment, as outlined in Section 314(a)(1)(A-F), constitute the minimal requirements for approval and for subsequent grant assistance as required by Section 314(a)(4).

For purposes of Clean Lakes Program reporting, this section of the Lake Water Quality Assessment chapter should focus on publicly owned public access lakes that the State considers significant (as defined by the State). Only significant publicly owned lakes are eligible for funding under Section 314 of the CWA. Therefore, for the purposes of this section, the term "lake" will refer to "significant publicly owned lakes/reservoirs/ponds." Although all lakes should be included in the summary tables described in the "Summary Statistics" section above, the reporting requirements described below are specific to the Clean Lakes Program. If States wish to report such information for private lakes, they may do so using similar tables. However, totals for Section 314 significant publicly owned lakes must always be distinguished from private lakes. For example, see Tables 7-7 and 7-7a. WBS can be used to generate these tables if significant publicly owned lakes are coded as such in WBS Screen 1.

In order to remain eligible to receive Clean Lakes funding, all States must meet the reporting requirements of Section 314 (a)(1)(A-F). This information, required biennially, must be submitted as part of a State's 305(b) report. The Regional Clean Lakes Coordinators will review these reports for approval/disapproval, determine the State's eligibility for Clean Lakes funding, and notify the EPA Headquarters Clean Lakes Program of the State's eligibility status. Since 1989, Clean Lakes Program congressional appropriations have provided funding to over 45 States and Tribes for cooperative agreements entitled "lake water quality assessments." Although these awards are generally intended to build and strengthen State/Tribal lake programs, a specific objective of these agreements is to assist the States and Tribes in meeting the reporting requirements of Section 314. As with any cooperative agreement or grant, there is an associated "approval" process standard to the administration of these awards (done by the Regional grants administration staff). **This approval is separate from the above-mentioned approval/disapproval (by the Regional Clean Lakes Coordinator) of the lake water quality information submitted in the State's 305(b) report.**

(NOTE: If a State chooses to submit a "lake water quality" report in addition to a 305(b) report, the State should ensure that the information required specifically by Section 314(a) is included in the biennial 305(b) report.)

The Clean Lakes section of the report should reflect the status of lake water quality in the State, restoration/protection efforts, and trends in lake water quality. The text of this chapter should include narrative discussions and summary information that should be supported by specific information on each lake. Lake-specific information may be submitted by computer disk or a hard-copy appendix to the State report.

Each State should report the following information:

Background --

- The State's definition of "significant" as it relates to the purposes of this assessment. The definition must consider public interest and use.

Table 7-7. Trophic Status of Significant Publicly Owned Lakes

	Number of Lakes	Acreage of Lakes
Total		
Assessed		
Oligotrophic		
Mesotrophic		
Eutrophic		
Hypereutrophic		
Dystrophic		
Unknown		

Table 7-7a. Trophic Status of Other Lakes

	Number of Lakes	Acreage of Lakes
Total		
Assessed		
Oligotrophic		
Mesotrophic		
Eutrophic		
Hypereutrophic		
Dystrophic		
Unknown		

- Total number of significant publicly owned lakes and number of acres of significant publicly owned lakes in the State.

- Any other background information the State considers relevant to this discussion.

Trophic Status [314(a)(1)(A)] --

- The total number of lakes and lake acres in each trophic class (dystrophic, oligotrophic, mesotrophic, eutrophic, hypertrophic). Table 7-7 shows one way to present the information.

- A discussion of the approach used to determine trophic status and why it was selected.

Control Methods [314(a)(1)(B)] --

- A description of procedures, processes, and methods to control sources of pollution to lakes including
  - point and nonpoint source controls
  - land use ordinances and regulations designed to protect lake water quality.

A general description of the State pollution control programs as they relate to the protection of lake water quality. In particular, discuss the State lake management program, including related activities under the nonpoint source, point source, wetlands, and emissions control programs, and any other relevant program activities. Also, describe the State's water quality standards that are applicable to lakes.

Restoration/Protection Efforts [314(a)(1)(C)] --

- A general description of the State's plans to restore and/or protect the quality of its lakes. This is the State's management plan for its lakes program and should focus on the cooperative working relationships among Federal, State, Tribal, and local agencies concerned with lake protection, restoration, and management.

- A description and tabulation of techniques to restore lake water quality. Table 7-8 provides a list of lake rehabilitation techniques as well as a format for reporting the number of lakes and the acreage of lakes where each technique has been applied. The WBS can be used to generate Table 7-8 if users enter data in the following WBS data fields for each individual lake waterbody: the Control Measure field, the Restoration Measure field, and the Significant Publicly Owned Lake field. Note that the WBS allows users to create additional control and restoration codes as needed.

Table 7-8. Lake Rehabilitation Techniques

*Rehabilitation Technique	Number of Lakes Where Technique Has Been Used	Acres of Lakes Where Technique Has Been Used
In-lake Treatments		
Phosphorus Precipitation/Inactivation		
Sediment Removal/Dredging		
Artificial Circulation to Increase Oxygen		
Aquatic Macrophyte Harvesting		
Application of Aquatic Plant Herbicides		
Drawdown to Desiccate and/or Remove Macrophytes		
Hypolimnetic Aeration		
Sediment Oxidation		
Hypolimnetic Withdrawal of Low DO Water		
Dilution/Flushing		
Shading/Sediment Covers or Barriers		
Destratification		
Sand or Other Filters Used to Clarify Water		
Food Chain Manipulation		
Biological Controls		
Other In-lake Treatment (Specify)		
Watershed Treatments		
Sediment Traps/Detention Basins		
Shoreline Erosion Controls/Bank Stabilization		
Diversion of Nutrient Rich In-flow		
Conservation Tillage Used		
Integrated Pest Management Practices Applied		
Animal Waste Management Practices Installed		
Porous Pavement Used		
Redesign of Streets/Parking Lots to Reduce Runoff		
Road or Skid Trail Management		
Land Surface Roughening for Erosion Control		

Table 7-8. Lake Rehabilitation Techniques (continued)

*Rehabilitation Technique	Number of Lakes Where Technique Has Been Used	Acres of Lakes Where Technique Has Been Used
Riprapping Installed		
Unspecified Type of Best Management Practice Installed		
Other Watershed Controls (Specify)		
Other Lake Protection/Restoration Controls		
Local Lake Management Program In-place		
Public Information/Education Program/Activities		
Local Ordinances/Zoning/Regulations to Protect Lake		
Point Source Controls		
Other (Specify)		

- A description and tabulation of Lake Water Quality Assessment grants and Phase I, Phase II, and Phase III Clean Lakes Program projects that have been undertaken and/or completed. Table 7-9 shows one way to present this information. State Clean Lakes records or EPA's Clean Lakes Program Management System (CLPMS) can provide the information needed for Table 7-9. For more information or to obtain a copy of CLPMS, contact the EPA Headquarters Clean Lakes Program staff at (202) 260-5404.

<u>Impaired and Threatened Lakes [314(a)(1)(E)]</u> --

- Provide summary tables on designated use support and causes and sources of nonsupport in lakes similar to Tables 7-3 through 7-6. Include information on threatened lakes, if available.

- A discussion of State water quality standards as they apply to lakes. If water quality standards have not been established for lakes, the measure used to determine impairment or threatened status should be identified.

Table 7-9. List of Clean Lakes Program Projects Active During 1994–1995 Reporting Period

Name of Project	Type of Project[a]	Federal Funding ($)	Problems Addressed	Management Measures Proposed or Undertaken[b]	Completed? (Yes/No)

[a] Lake Water Quality Assessment (LWQA), Phase I, Phase II, or Phase III.
[b] Refer to Table 7-8 for a partial list of management/rehabilitation measures.

Acid Effects on Lakes [314(a)(1)(D); 314(a)(1)(E)] --

- The number of lakes and lake acres that have been assessed for high acidity. If information is available, discuss the nature and extent of toxic substances mobilization (release from sediment to water) as a result of high acidity. Table 7-10 shows one way to present this information.

- The number of lakes and lake acres affected by high acidity. Indicate the measure (pH, acid-neutralizing capacity) used to determine acidic condition and the level at which the State defines "affected."

- A discussion of the specific sources of acidity, with estimates of the number of affected lake acres attributed to each source of acidity. Table 7-11 shows one way to present the information. WBS will generate Tables 7-10 and 7-11 if the required data are entered (see *WBS User's Guide*).

- A description of the methods and procedures used to mitigate the harmful effects of high acidity, including innovative methods of neutralizing and restoring the buffering capacity of lakes and methods of removing from lakes toxic metals and other toxic substances mobilized by high acidity.

Table 7-10. Acid Effects on Lakes

	Number of Lakes	Acreage of Lakes
Assessed for Acidity		
Impacted by High Acidity		
Vulnerable to Acidity		

Table 7-11. Sources of High Acidity in Lakes

Source	Number of Lakes Impacted	Acreage of Lakes Impacted
Acid Deposition		
Acid Mine Drainage		
Natural Sources		
Other (list)		

NOTE: See Section 3.7 for description of natural sources.

Toxic Effects on Lakes [314(a)(1)(E); 314(a)(1)(F)] --

- If not provided in Public Health/Aquatic Life Concerns chapter (Chapter 7), the number of lakes and number of lake acres monitored for toxicants and those with elevated levels of toxic pollutants.
- A discussion of the sources of toxic pollutants in lakes, with estimates of the number of affected lake acres attributed to each source of toxic pollutants.

Trends in Lake Water Quality [314(a)(1)(F)] --

- A general discussion of apparent lake water quality trends. Include the total number of lakes and lake acres in each trend category (improved, degraded, stable or unknown). Table 7-12 shows one way to present this information. WBS can be used to generate Table 7-12.

- A discussion of how apparent trends were determined (e.g., changes in use support status, statistical trend analysis of water quality parameters). Indicate the time frame of analysis. If sufficient data are available, States should report on trends in trophic status, trends in toxic pollutants or their effects, and trends in acidity or its effects. For a lake, the trend in trophic status may be more important than the trophic status itself.

Note: New technical guidance for analyzing trends is available—*Statistical Methods for the Analysis of Lake Water Quality Trends*, EPA 841-R-93-003 U.S. EPA 1994). Contact the Watershed Branch at (202) 260-7074 for a copy.

Table 7-12. Trends in Significant Public Lakes

	Number of Lakes	Acreage of Lakes
Assessed for Trends		
Improving		
Stable		
Degrading		
Trend Unknown		

Chapter Five: Estuary and Coastal Assessment

Summary Statistics (including Great Lakes shoreline)

States should report summary statistics for use support and causes and sources of impairment in estuaries, coastal waters, and the Great Lakes. The format should be similar to Tables 7-3, 7-5, and 7-6 for all estuaries in the State. The reporting unit for estuaries in these tables is square miles. Similarly, separate tables should be prepared for coastal waters and the Great Lakes using shoreline miles as the size unit. WBS includes a Great Lakes waterbody category with size units of (shoreline) miles. For Great Lakes embayments, States may use the "estuary" waterbody category if they wish to report impacts in areal units (square miles).

Special Topics

As part of the national initiative to increase understanding of estuarine and near-coastal waters and the Great Lakes and to better direct pollution control efforts in these waters, EPA asks the States to provide information on five overall topics: eutrophication, habitat modification including riparian and shoreline conditions such as erosion, changes in living resources, toxic contamination, and pathogen contamination.

All States are asked to collect and provide coastal, estuary, and Great Lakes information as appropriate. Although EPA understands that these data may not be readily available in every coastal State, efforts to produce this information will result in a broader understanding of our coastal and estuarine resources. Those areas for which no data are currently available should be clearly identified by the States. Also, States are encouraged to discuss their methods for collecting the information and how these methods may limit use of the data.

In this chapter (Chapter 5), States should report further information on estuaries, coastal waters, and Great Lakes including

- **A case study** from at least one estuary/coastal/Great Lakes area. States are encouraged to describe problems and challenges, not just "success stories."

- **Information on eutrophication** including:

  - occurrence, extent, and severity of hypoxia and anoxia (low or complete absence of dissolved oxygen);

  - occurrence, extent, and severity of algal blooms possibly related to pollution; and

  - estimated nutrient loadings broken out by point sources, combined sewer overflows, and nonpoint sources.

- Information on projected land use changes and their potential impact on water quality, habitat, and living resources.

- **Information on habitat modification** including the status and trends in acreage of submerged aquatic vegetation; acreage of tidal wetlands; miles of diked, bulkheaded, or stabilized shoreline; extent of riparian and shoreline conditions (e.g., erosion); and dredging operations.

- Information on **changes in living resources** including discussion of any increases or decreases in the abundance or distribution of species dependent on estuarine, near coastal, or Great Lakes waters; changes in species diversity over time; presence and extent of exotic or nuisance species; and changes in the amount of catch. Wherever possible, these changes should be discussed in terms of their causes (water quality versus changes in fishing regulations, overuse of resources, etc.).

EPA encourages States to include GIS and other maps illustrating the above information.

EPA and NOAA are paying special attention to coastal issues. Any data acquired through these agencies' coastal initiatives should be included in the assessment. Data of particular interest include data collected under the National Coastal Monitoring Act of 1992, which establishes the basis for a comprehensive national monitoring program for coastal ecosystems.
In addition, the State should discuss its activities, if any, under EPA's Great Lakes Program, the National Estuary Program, the Near Coastal Water Pilot Projects, the Chesapeake Bay Program, the Gulf of Mexico Program, the Mid-Atlantic Bight and New York Bight programs and the CZARA Section 6217 nonpoint source control program. Any additional State programs, research activities, or new initiatives in estuarine or coastal waters or the Great Lakes should be discussed in this chapter. Information on coastal (tidal, estuarine) or Great Lakes wetlands should be reported in Chapter 6: Wetlands Assessment.

Chapter Six: Wetlands Assessment

Protecting the quantity and quality of the Nation's wetland resources is a high priority at EPA, other Federal agencies, and many State and local governments. The 1993 Administration Wetlands Plan calls for a no overall net loss in the short term and a net increase in the quantity and quality of our Nation's wetlands in the long run. Achieving this requires regulatory and nonregulatory programs and a partnership of Federal, State, and local governments and private citizens.

Wetlands, as waters of the United States, receive full protection under the Clean Water Act including water quality standards under Section 303 and monitoring under Section 305(b). At present, wetlands monitoring programs are in their infancy (see 1992 *National Water Quality Inventory Report to Congress*) and no State is operating a statewide wetlands monitoring program. For this reason, it is important that States in their 1996 305(b) reports describe their efforts to build wetland monitoring programs or to integrate wetlands into existing surface water monitoring programs. EPA encourages States to report on specific monitoring methods and criteria either already in effect or under development.

In addition, States should report on their efforts to achieve the no overall net loss goal for wetlands functions and values. Ideally, this report should serve as a planning/management tool to prioritize program work and areas needing information and technical assistance. States are encouraged to make recommendations to EPA on tools that are needed to make the Administration goals a reality. EPA requests that Tribes report on wetlands to the extent practicable.

Previously reported information should be updated where applicable. States should report on coastal (i.e., tidal, estuarine, or Great Lakes) wetlands in this section of their report rather than in Chapter 5 (Estuary and Coastal Assessment).

States that wish to do so may report separately on riparian areas that are not jurisdictional wetlands. Riparian areas are essential components of riverine ecosystems. In the western United States, wetlands are sparse and riparian habitat is often the only suitable habitat for many animals and plant species. Riparian areas are also important for their ability to remove pollutants.

Section 305(b) staff are encouraged to coordinate closely with other relevant State agencies such as fish and wildlife departments to respond to the reporting guidelines below. To the extent possible, States are encouraged to geographically or spatially represent the information (e.g., report information by watershed unit and include maps).

<u>**Extent of Wetlands Resources**</u>

States should describe any assessments of wetlands acreage changes over time (by wetland type if that information is available). This description should include efforts to track no overall net loss or target priority restoration sites (e.g., through tracking Section 401 certification of Section 404 permits; current or planned inventory programs such as U.S. Fish and Wildlife Service National Wetlands Inventory or State inventory programs; use of geographic information systems (GISs); or comparison of predevelopment inventories with more current wetlands information). States are encouraged to provide information on wetlands types and their historical, most recent, and second most recent acreages (specify when available). Table 7-13 is provided as a guide for formatting information; see also the example tables from Wisconsin's 1994 305(b) report in Appendix H. Define wetlands types using the Cowardin classification system currently used by the U.S. Fish and Wildlife Service (Cowardin et al., 1979; FWS/OBS-79/31). If another classification system is used, please identify the system. Also, list sources of information and discuss reasons for acreage change, where known. EPA encourages States to include maps of significant wetlands if this information is available and to describe current or planned inventory programs for their wetlands resources.

Potential sources of information include the U.S. Fish and Wildlife Service National Wetlands Inventory, the State fish and game department, and the State parks and recreation agency (wetlands are to be included in State Outdoor Recreation Plans).

Table 7-13. Extent of Wetlands, by Type

Wetland Type[a]	Historical Extent (acres)[1]	1994 Reported Acreage[2] (second most recent acreage)	Most Recent Acreage[3] (if any recorded)	% Change From 1994 to Most Recent

Sources of Information
1 (include date of inventory)
2
3 (include date of inventory)

[a] Use Cowardin et al. (1979)--*Classification of Wetlands and Deepwater Habitats of the United States*, Fish and Wildlife Report FWS/OBS-79/31--or report classification system used.

Integrity of Wetlands Resources

EPA encourages States to report on the attainment of designated uses in their wetlands areas. To the extent possible, complete Tables 7-3, 7-5, and 7-6 (designated use support, causes and sources of impairment, including nonpoint sources) for wetlands and present in this chapter. Please note your State's methodology for evaluation (as they currently vary by State) including source of data (e.g., Section 404 permit information, onsite monitoring, or satellite or aerial photography interpretation). In their 1992 305(b) reports, 25 States reported on sources of wetlands loss, 14 reported on causes and sources degrading wetlands, and 8 States reported on designated use support in some portion of their wetlands.

States should discuss their efforts (including current research) to develop wetlands monitoring programs or to integrate wetlands into existing surface water monitoring programs. States should include information on the scope and comprehensiveness of the program (e.g., parametric and geographic coverage), types of monitoring, and how use support decisions are made. States should report on wetlands monitoring programs by volunteers and whether they are working to be able to use this information in the 305(b) report. Rhode Island Sea Grant and EPA jointly issued in January 1994 a national directory of volunteer monitoring programs, many of which have wetlands components (Rhode Island Sea Grant, 1994). States can obtain a copy from Alice Mayio, EPA Assessment and Watershed Protection Division, (202) 260-7018.

Development of Wetland Water Quality Standards

In July 1990, EPA published guidance on the level of achievement expected of States by the end of FY1993 in the development of wetlands water quality standards. Water quality standards for wetlands are necessary to ensure that, under the provisions of the Clean Water Act, wetlands are afforded the same level of protection as other waters. Development of wetlands water quality standards provides a regulatory basis for a variety of water quality management activities including, but not limited to, monitoring and assessment under Section 305(b), permitting under Sections 402 and 404, water quality certification under Section 401, and control of nonpoint source pollution under Section 319. In the 1992 305(b) reports, almost all States reported on their efforts to develop wetlands water quality standards; see Appendix H for the 1992 summary.

Table 7-14 is a guide for presenting tabular information on development of State wetlands water quality standards.

To supplement the information in Table 7-14, States should list designated uses for wetlands. In addition States should

- Briefly describe State efforts to develop narrative and numeric **biological criteria**. Provide examples where appropriate.

- Briefly describe classification of wetlands in your State **antidegradation policy**. Provide an example of how State antidegradation policies are used to protect critical wetlands.

- Indicate whether your State specifically identifies **wetlands as "waters of the State."**

- Briefly describe efforts to **integrate wetlands protection** through 401 certification and wetlands water quality standards **with the NPDES stormwater program**. Specifically, relate any criteria used in evaluating stormwater impacts to wetlands.

Additional Wetlands Protection Activities

This section is designed to update readers on State wetlands protection activities and provide States with an opportunity to exchange information on achievements and obstacles in protecting their wetlands resources. Discussions need not be extensive or detailed but should

- Describe efforts to **integrate wetlands into the watershed protection or basinwide approach.** Describe county-level programs to integrate wetlands into local planning

- Briefly describe **particularly noteworthy State activities**, past and present, funded through the Section 104(b)3 wetlands grant program.

- Briefly describe the most effective mechanism or innovative approach used in protecting wetlands (such as Outstanding Resource Waters, State Wetland Conservation Plan, watershed or local planning, State Program General Permits under Section 404, Section 401 certification and wetlands water quality standards). Note if these are being partially supported by the 104(b)(3) State Wetland Grant Program.

- Briefly describe agency responsibilities for wetlands protection and coordination between the water quality agency and other natural resource agencies.

Please discuss any challenges your State is facing in developing wetlands monitoring programs and any recommendations you have for EPA.

Appendix G includes the wetlands chapter from Minnesota's 1992 305(b) report as an example for States to generate ideas for reporting on and developing wetlands monitoring programs.

Table 7-14. Development of State Wetland Water Quality Standards

	In Place	Under Development	Proposed
Use Classification			
Narrative Biocriteria			
Numeric Biocriteria			
Antidegradation			
Implementation Method			

NOTE: This table merely clarifies reporting requirements contained in earlier versions of this guidance. This table is not a new reporting requirement.

Chapter Seven: Public Health/Aquatic Life Concerns

In this chapter, States report on selected public health/aquatic life concerns. The 305(b) Consistency Workgroup recommended that Tables 7-15 through 7-17 in this chapter be optional for 1996. Tables 7-15 and 7-17 are not useful for national compilations because this could lead to erroneous conclusions. For example, some States only store data for the last column of Table 7-15, which can lead to the appearance that a high percentage of monitored waters show elevated toxics. Fish kills (Tables 7-17) are difficult for some State 305(b) programs to track, causes and sources of fishkills are often unknown, and summary statistics are not useful above the State level. Both of these tables may contain useful information for an individual State, however. For these reasons, these tables are optional for State 305(b) reporting.

Table 7-16 contains information that is available through EPA national listings and therefore is optional. EPA will use the national listings in preparing the 1996 305(b) Report to Congress. Nonetheless, a State may choose to include its own information for the public's benefit and to supplement national data.

EPA will provide national listings to States to support the preparation of Table 7-18; however, States are asked to prepare the table. Similarly, Table 7-19 is not optional because it contains important information not available elsewhere.

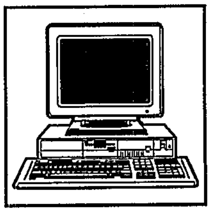
Size of Waters Affected by Toxicants

Using the format in Table 7-15, States may take the option to report on the extent of toxicant-caused problems in each waterbody type. WBS can generate the totals needed for this table from waterbody-specific information. Each State defines "elevated levels of toxicants," which can include exceedances of numeric State water quality standards, 304(a) criteria, and/or Food and Drug Administration (FDA) action levels or levels of concern (where numeric criteria do not exist). Elevated levels of toxicants may occur in the water column, in fish tissue, or in sediments. As a means of providing perspective, States should discuss which toxic pollutants have been monitored for and include a list of those toxic pollutants for which the State has adopted numeric criteria.

Table 7-15. Total Size Affected by Toxicants (optional)

Waterbody	Size Monitored for Toxicants	Size with Elevated Levels of Toxicants
Rivers (miles)		
Lakes (acres)		
Estuaries (miles^2)		
Coastal waters (miles)		
Great Lakes (miles)		
Freshwater wetlands (acres)		
Tidal wetlands (acres)		

WBS Users--To generate the totals needed for Table 7-15 from the WBS, the Monitored for Toxics field in WBS must be entered as "yes" for each appropriate waterbody.



Totals for the last column in Table 7-15 can be generated from waterbody-specific information in the WBS if total size affected by toxicants is stored for each waterbody using Cause Code 2400 ("Total Toxicants"). For example, assume a waterbody is 10 miles in size, with 4 miles impacted by metals and 3 miles impacted by pesticides. However, the total portion of the waterbody that is impacted by toxicants may be only 5 miles (because some miles have both metals and pesticides). In WBS, 5 miles must be entered under Code 2400: Total Toxicants for WBS to accurately calculate Statewide Summaries for Table 7-15:

Code 2400:	**Total Toxicants**	5 miles (must enter in WBS even if 0200, 0500 entered also)
Code 0200:	Pesticides	3 miles
Code 0500:	Metals	4 miles

Refer also to the *WBS Users Guide.*

Any of the following codes can be considered toxicants: 0200 (pesticides), 0300 (priority organics), 0500 (metals), 0600 (ammonia, un-ionized), and 0700 (chlorine).

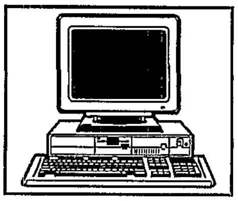
Public Health/Aquatic Life Impacts

EPA has developed a National Listing of Fish Consumption Advisories to encourage information exchange among (and within) States. States reviewed and corrected a draft of the Listing in 1994. For 1995, EPA has updated the Listing to include electronic mapping capabilities and all known advisories as of September 1994. EPA will provide the Listing to State 305(b) Coordinators in mid-1995 for use in the 1996 reporting cycle. The EPA contact for the database is Jeffrey Bigler at (202) 260-1305.

EPA has also developed a national database of sediment contamination by toxics, the National Sediment Inventory. EPA will also provide this listing to 305(b) Coordinators for use in preparing Table 7-18. The EPA contact is Tom Armitage (202) 260-5388. EPA will report information on fish consumption advisories and sediment contamination from EPA's national databases. States may choose to provide their own listings of fish consumption advisories and sediment-contaminated waters if they are concerned that the national-level data may not be sufficiently current or accurate.

If the State 305(b) agency collects the following types of information for management purposes, reporting it in the 305(b) report will enhance the value of the report to the public and EPA.

- **Fishing or shellfishing advisories** currently in effect
- **Pollution-caused fish kills/abnormalities**; States may choose to distinguish recurring fish kills from other pollution-caused fish kills occurring during the reporting period (clearly identify approach used)
- **Sites of known sediment contamination**
- **Shellfish restrictions/closures** currently in effect
- **Restrictions on surface drinking water supplies** (see next section)
- **Restrictions on bathing areas** during this reporting cycle
- **Incidents of waterborne disease** during this reporting cycle
- **Other aquatic life impacts** of pollutants and stressors (e.g., reproductive interference, threatened or endangered species impacts).



WBS Users--WBS offers two options for preparing Tables 7-16 through 7-19. First, WBS now contains a stand-alone module that exists mainly to prepare these particular tables.

Second, WBS also contains Aquatic Contamination Codes in the main WBS assessment screens that users may assign to a waterbody. By entering in these codes, WBS users can perform a wide variety of queries and generate lists of waterbodies that can be used to prepare Tables 7-16 through 7-20. The WBS Aquatic Contamination Codes are:

1 = Fish/shellfish tissue contamination above FDA/NAS/levels of concern
2 = Fish/shellfish advisory in effect
- 2a = Restricted consumption advisory for subpopulation
- 2b = Restricted consumption advisory, general population
- 2c = "No consumption" advisory for a subpopulation
- 2d = "No consumption" advisory or ban, general population
- 2e = Commercial fishing ban

3 = Bathing area closure, occurred during reporting period
4 = Pollution-related fish abnormality observed during reporting period
5 = Shellfish advisory due to pathogens, currently in effect
6 = Pollution-caused fish kill, occurred during reporting period
7 = Sediment contamination
8 = Surface drinking water supply closure, occurred during reporting period
9 = Surface drinking water supply advisory, occurred during reporting period
10 = Waterborne disease incident, occurred during reporting period.

See the *WBS User's Guide* for more information.

Table 7-16. Waterbodies Affected by Fish and Shellfish[a] Consumption Restrictions (optional[b])

Name of Waterbody and Identification No. or Reach No.	Waterbody Type	Size Affected	Type of Fishing Restriction				Cause(s) (Pollutant[s]) of Concern[b]
			No Consumption		Limited Consumption		
			General Population	Sub-population	General Population	Sub-Population	

[a] Does not include shellfish harvesting restrictions due to pathogens. See Table 7-19.

[b] Optional because much of this information is available in EPA's National Inventory of Fish Consumption Advisories, which is available to 305(b) Coordinators. EPA will use the Inventory in the 1996 Report to Congress. The EPA contact for the Inventory is Jeffrey Bigler, (202) 260-1305.

Table 7-17. Waterbodies Affected by Fish Kills and Fish Abnormalities (optional[a])

Name of Waterbody and Identification No. or Reach No.	Waterbody Type	Size Affected	Cause(s) (Pollutant[s]) of Concern	Source(s) of Pollutant(s)	Number of Fish Killed	Number of Fish with Abnormalities

[a] Optional because some States do not compile this information and summary statistics are not useful above the State level.

Table 7-18. Waterbodies Affected by Sediment Contamination

Name of Waterbody and Identification No. or Reach No.	Waterbody Type	Size Affected	Causes(s) (Pollutant[s]) of Concern	Source(s) of Pollutant(s)

Note: EPA's National Sediment Inventory contains supporting information for this table. Inventory results are available to 305(b) Coordinators; the EPA contact is Tom Armitage (202) 260-5388.

Table 7-19. Waterbodies Affected by Shellfish Advisories due to Pathogens

Name of Waterbody and Identification No. or Reach No.	Waterbody Type	Size Affected	Sources of Pathogens and/or Indicators[a]

[a] Indicators include, but are not limited to, fecal coliforms and *E. coli*.

Table 7-20. Waterbodies Affected by Bathing Area Closures

Name of Waterbody and Identification No. or Reach No.	Waterbody Type	Size Affected	Cause(s) (Pollutant[s]) of Concern[a]	Source(s) of Pollutant(s)	Comments (Chronic or One-time Event)

[a] Pollutants include, but are not limited to, medical waste, fecal coliforms, *E. coli*, enterococci, and other indicators of pathogenic contamination.

Public Health: Drinking Water

A waterbody that supports drinking water use meets the goal of supplying safe drinking water with conventional treatment. In past reporting cycles, only a small percentage of river/stream miles or lake acres have been assessed for this designated use. EPA has worked with States to define a new approach that will improve the assessment and reporting of drinking water use support for source waters (see Section 5.4).

For 1996 and beyond, EPA requests that States assess whether waterbodies meet the drinking water designated use by considering three types of data: ambient (source) water monitoring data, public water supply (PWS) finished water monitoring data, and data on contamination-based use restrictions imposed on source waters. The following assessment methodology should provide a more uniform framework for assessing drinking water use support as more data become available and in subsequent reporting cycles.

There are several changes for assessing drinking water use support between the 1994 and the 1996 305(b) *Guidelines*. States are requested to:

- Target for consideration the State water quality standards for source water-related contaminants for which National Primary Drinking Water Regulations (NPDWR) have been established,
- Continue to use monitoring data from ambient (source) water monitoring of waterbodies under the Clean Water Act, but focus on monitoring locations that are sufficiently close to drinking water intakes to pertain to drinking water quality,
- Make use of the expanded data that are becoming available from PWS compliance monitoring under the Safe Drinking Water Act (SDWA), and
- Expand the use of information on public water system source water closures, use restrictions, increased monitoring, and systems requiring beyond conventional treatment.

A list of the contaminants regulated under the SDWA and the Maximum Contaminant Level (MCL) for each contaminant is included in Section 5.4 as Table 5-6. **States are asked to consider the State WQS for these contaminants (provided that the WQSs are at least as stringent as the MCL) in assessing drinking water use support for both ground water and surface water sources.** In the absence of ambient criteria for drinking water use, States may opt to use the MCL.

PWSs are required to monitor their finished water for these chemicals and microbiological contaminants. The chemical contaminants follow a standardized monitoring framework, with the first round of monitoring for most contaminants to be completed by December 31, 1995. States may also consider additional contaminants that are of local or regional interest in assessing drinking water use support of source waters.

Assessment of Drinking Water Use Support for Individual Waterbodies

EPA requests that States use information on ambient water quality, finished water quality, and use restrictions for each drinking water contaminant assessed to determine the use support for each assessed waterbody. Figure 7-1 depicts the contaminants, data sources, and assessment framework that should be used to assess the support of each waterbody for drinking water use. States should refer to Section 5-4 for information on assessing drinking water use for waterbodies.

The use support status of assessed waterbodies is requested in Tables 7-21 and 7-22. EPA requests that States use information on ambient water quality, finished water quality, and use restrictions for each drinking water contaminant assessed to determine the use support for each assessed waterbody. For waterbodies that fully support drinking water use, States should complete Table 7-21 and specify the contaminants that were included in the assessment. For waterbodies that are fully supporting but threatened, partially supporting, or not supporting drinking water use, States should complete Table 7-22 and identify the contaminants that have caused the limited support or nonsupport status.

State Level Summary of Drinking Water Use Assessments for Rivers, Streams, Lakes, and Reservoirs

EPA requests that States use the information assembled in Tables 7-21 and 7-22 to estimate the total waterbody area that has been assessed for drinking water use support. In addition, States are requested to complete Tables 7-23 and 7-24 to provide an estimate of the total waterbody areas that support drinking water use, are fully supporting but threatened for drinking water use, partially support drinking water use, and do not support drinking water use.

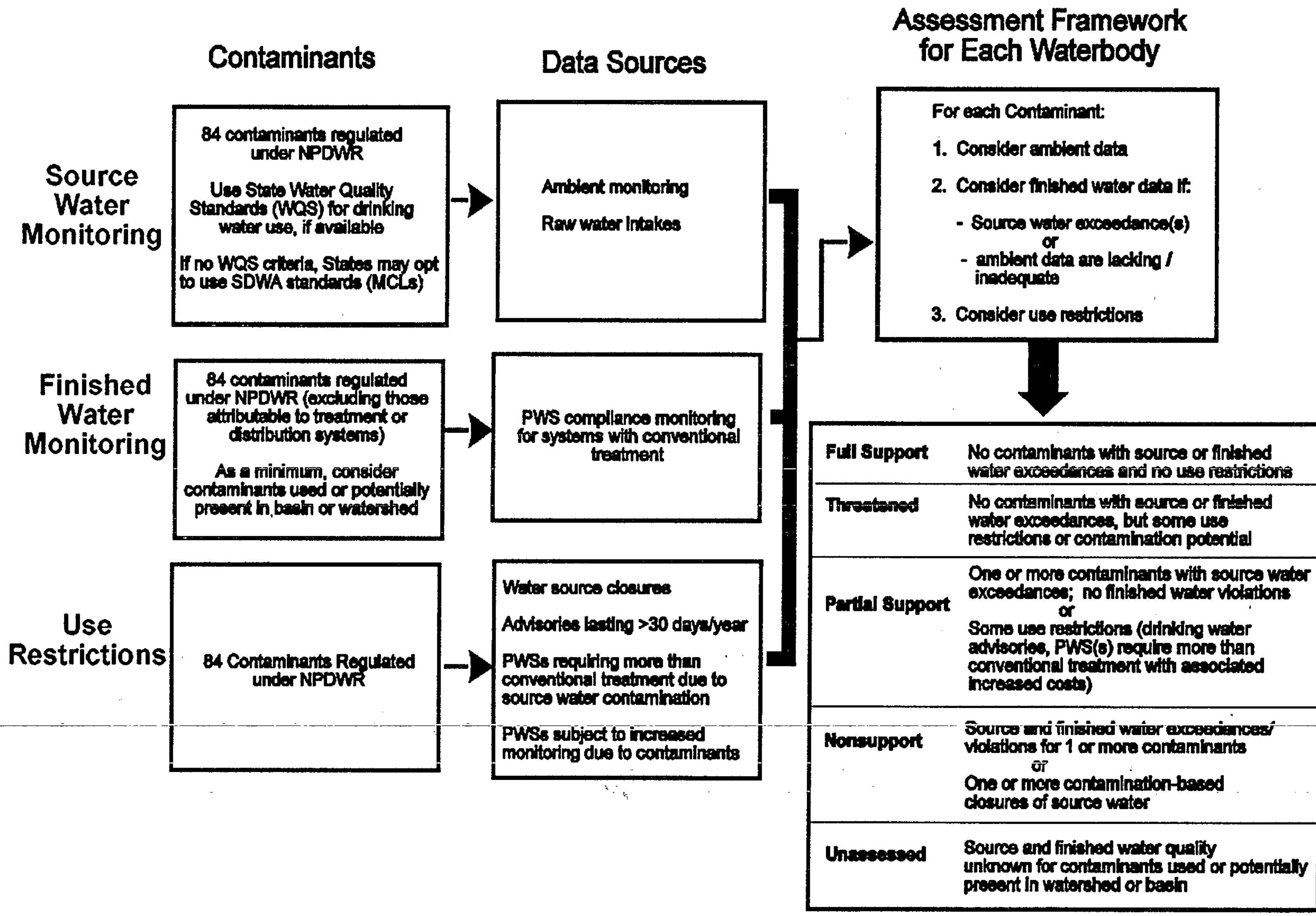


Figure 7-1. Assessing Rivers, Streams, Lakes, and Reservoirs for Drinking Water Use

Table 7-21. Summary of Waterbodies Fully Supporting Drinking Water Use

Rivers and Streams (List Waterbodies)	Contaminants Included in the Assessment[1]	Lakes and Reservoirs (List Waterbodies)	Contaminants Included in the Assessment[1]

[1] Contaminants may be either listed individually, or reported as contaminant groups (e.g., pesticides, metals, semivolatile organic compounds, etc.)

Table 7-22. Summary of Waterbodies Not Fully Supporting Drinking Water Use

Waterbodies (List)	Source(s) of Data (✓)			Characterization[1]	Major Causes (List Most Significant Contaminants)
	Ambient	Finished	Use Restrictions		
Rivers and Streams					
Lakes and Reservoirs					

[1] Characterization: Fully Supporting but Threatened, Partially Supporting, Not Supporting.

Table 7-23. State-Level Summary of Drinking Water Use Assessments for Rivers and Streams[1,2]

Total Miles Designated for Drinking Water Use ______				
Total Miles Assessed for Drinking Water Use ______				
Miles Fully Supporting Drinking Water Use		**% Fully Supporting Drinking Water Use**		**Major Causes (List Most Significant Contaminants) ⬇**
Miles Fully Supporting but Threatened For Drinking Water Use		**% Fully Supporting but Threatened for Drinking Water Use**		
Miles Partially Supporting Drinking Water Use		**% Partially Supporting Drinking Water Use**		
Miles Not Supporting Drinking Water Use		**% Not Supporting Drinking Water Use**		
Total Miles Assessed for Drinking Water Use			100%	

1 EPA requests that States include a separate list of contaminants that are generally evaluated in source water (i.e., contaminants that are of State or regional concern).

2 Refer to Table 7-3 (streams and rivers) for drinking water use support summary data.

Table 7-24. State-Level Summary of Drinking Water Use Assessments for Lakes and Reservoirs[1,2]

Total Waterbody Area Designated for Drinking Water Use ____________

Total Waterbody Area Assessed for Drinking Water Use ____________

Acres Fully Supporting Drinking Water Use		% Fully Supporting Drinking Water Use		**Major Causes** (List Most Significant Contaminants) ⬇
Acres Fully Supporting but Threatened For Drinking Water Use		% Fully Supporting but Threatened for Drinking Water Use		
Acres Partially Supporting Drinking Water Use		% Partially Supporting Drinking Water Use		
Acres Not Supporting Drinking Water Use		% Not Supporting Drinking Water Use		
Total Acres Assessed for Drinking Water Use			100%	

1 EPA requests that States include a separate list of contaminants that are generally evaluated in source water (i.e., contaminants that are of State or regional concern).

2 Refer to Table 7-3 (lakes) for drinking water and use support summary data.

SECTION 8

1996 305(b) CONTENTS — PART IV: GROUND WATER ASSESSMENT

Section 106(e) of the Clean Water Act requests that each State monitor the quality of its ground water resources and report the status to Congress every 2 years in its State 305(b) report. To provide guidance in preparing the 305(b) reports, EPA worked with States to develop a comprehensive approach to assess ground water quality that takes into account the complex spatial variations in aquifer systems, the differing levels of sophistication among State programs, and the expense of collecting ambient ground water data. This approach incorporates all of the components requested during previous 305(b) reporting periods.

Previous State 305(b) reports presented an overview of the State resource manager's perspective on ground water quality based on monitoring of known or suspected contamination sites and on finished water quality data from public water supply systems. These data did not always provide a complete and accurate representation of ambient ground water quality (i.e., background or baseline water quality conditions of an aquifer or hydrogeologic setting). Neither do these data provide an indication of the extent and severity of ground water contaminant problems. Finally, the broad-brushed approach used in past 305(b) reports to define ground water quality for the entire State did not allow States to develop and report more detailed results for locations of greatest ground water use and vulnerability.

For 1996, EPA is encouraging States to assess ground water quality for selected aquifers or hydrogeologic settings within the State or portions of aquifers or hydrogeologic settings that reflect State priority considerations. The assessment of ground water quality within specific aquifers or hydrogeologic units will provide for a more meaningful interpretation of ground water quality within the State. It will also enable States to report results for locations of special interest.

EPA recognizes that data collection and organization varies among the States, and that a single data source for assessing ground water quality does not exist for purposes of the 1996 305(b) reports. EPA encourages States to **use available data** that they believe best reflect the quality of the resource. States may choose to use one or multiple sources of data in the assessment of ground water quality. Several potential data sources have been identified, including:

- Ambient water quality data from dedicated monitoring well networks (optional)
- Raw or finished water quality data from ground-water-based public water supply wells
- Raw or finished water quality data from private or unregulated wells (optional).

In the absence of a dedicated ground water monitoring network, States may choose to use data collected from PWS in the assessment of ground water quality. These data are routinely collected by the States under the Safe Drinking Water Act and would not necessitate a separate and unique monitoring effort for purposes of the 1996 305(b) reporting process. Furthermore, drinking water criteria have been applied to the characterization of ground water in other areas of study, and national drinking water standards have been established and can be readily incorporated into the 305(b) framework providing a basis for national comparison. States that have access to other data sources that can be used to assess ground water quality are encouraged to use them if, in the judgment of the ground water professionals, the data have undergone sufficient quality assurance/quality control checks.

EPA recognizes that assessment of the entire State's ground water resources is a monumental task. Therefore, it is suggested that ground water quality be assessed within selected aquifers and/or hydrogeologic settings incrementally over the next 10 years. For 1996, States are encouraged to set a priority for reporting results for areas of greatest ground water demand and vulnerability. In future reporting periods, States will be encouraged to continue the process by expanding to include additional aquifers and/or hydrogeologic settings. In this way, an increasingly greater area of the State will be assessed. EPA encourages States to set a goal of fully assessing ground water quality within most of the State (approximately 75 percent of the State) in approximately 10 years.

In addition to introducing the assessment of ground water quality within selected aquifers or hydrogeologic settings within States, EPA is encouraging States to provide information on ground water-surface water interactions. This reflects the growing awareness of water resource managers of the importance of ground water-surface water interactions and their contribution to water quality problems. EPA does recognize that many of the problems related to ground water-surface water interactions are difficult to study, and as a result, limited data exist. As a consequence, reporting information on this subject is optional for 1996.

EPA and States represented on the 305(b) Consistency Ground Water Subgroup discussed the issues involved in development of the 1996

Guidelines. EPA and these States recognize and fully accept that there will be significant variability in the information that States will be able to provide in the 1996 305(b) reporting cycle. However, EPA expects that the direction of future reporting cycles will be evident, and that States will begin to develop plans and mechanisms to compile, organize, and evaluate the requested information for future reporting cycles.

Overview of Ground Water Contamination Sources

In previous 305(b) reports, States were asked to identify the contaminant sources and contaminants impacting their ground water resources. EPA will continue to request this information. However, for 1996, this information will be requested in two tables designed to provide an indication of the most critical contaminant sources and contaminants impacting ground water resources in the United States.

Table 8-1 requests information on which contaminant sources within the State are the greatest threat to ground water quality. Table 8-2 requests information on the stress that an aquifer or hydrogeologic setting within the State may be subjected to by assessing the type and number of sites present within the reporting area and whether there is confirmed ground water contamination associated with these sites. If desired, Table 8-2 also provides States the opportunity to indicate the status of actions being taken to address ground water contaminant problems. Tables 8-1 and 8-2 should be included in State 305(b) reports. Instructions for completion of these tables are on pages 8-5 and 8-7, respectively.

EPA developed Table 8-1 as a guide to States in reporting the major sources of contamination that threaten their ground water resources. The contaminant sources presented in Table 8-1 are based on information provided by States during previous 305(b) reporting periods. Using this list, States are encouraged to check the 10 highest-priority sources of ground water contamination. It is not necessary to individually rank the contaminant sources; however, the factors considered in selection should be included in the column provided. In addition, the major contaminants originating from each of the sources should be specified in the column provided. The list is not meant to be comprehensive and States are encouraged to identify additional sources that are unique to them or distinct from EPA's conventional use of terminology. States are encouraged to use the most detailed and reliable information available to them.

EPA worked with States to develop Table 8-2 as a means of assessing the stress on individual aquifers or hydrogeologic settings within the State. This information is being requested for the first time in 1996. States are encouraged to report information on the type and number of contaminant sources within the reporting area. In this way, States are able to report more detailed results for locations of special interest within the State.

Table 8-1. Major Sources of Ground Water Contamination

Contaminant Source	Ten Highest-Priority Sources (✓) (1)	Factors Considered in Selecting a Contaminant Source (2)	Contaminants (3)
Agricultural Activities			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications			
Storage and Treatment Activities			
Land application			
Material stockpiles			
Storage tanks (above ground)			
Storage tanks (underground)			
Surface impoundments			
Waste piles			
Waste tailings			
Disposal Activities			
Deep injection wells			
Landfills			
Septic systems			
Shallow injection wells			
Other			
Hazardous waste generators			
Hazardous waste sites			
Industrial facilities			
Material transfer operations			
Mining and mine drainage			
Pipelines and sewer lines			
Salt storage and road salting			
Salt water intrusion			
Spills			
Transportation of materials			
Urban runoff			
Other sources (please specify)			
Other sources (please specify)			

Instructions/Notes for Table 8-1

1. Check (✓) up to 10 contaminant sources identified as highest priority in your State. Ranking is not necessary.

2. Specify the factor(s) used to select each of the contaminant sources. Denote the following factors by their corresponding letter (A through G) and list in order of importance. Describe any additional or special factors that are important within your State in the accompanying narrative.

   A. Human health and/or environmental risk (toxicity)
   B. Size of the population at risk
   C. Location of the sources relative to drinking water sources
   D. Number and/or size of contaminant sources
   E. Hydrogeologic sensitivity
   F. State findings, other findings
   G. Other criteria (please add or describe in the narrative)

3. List the contaminants/classes of contaminants considered to be associated with each of the sources that was checked. Contaminants/contaminant classes should be selected based on data indicating that certain chemicals or classes of chemicals may be originating from an identified source. Denote contaminants/classes of contaminants by their corresponding letter (A through M).

   A. Inorganic pesticides
   B. Organic pesticides
   C. Halogenated solvents
   D. Petroleum compounds
   E. Nitrate
   F. Fluoride
   G. Salinity/brine
   H. Metals
   I. Radionuclides
   J. Bacteria
   K. Protozoa
   L. Viruses
   M. Other (please add or describe in the narrative)

Table 8-2. Ground Water Contamination Summary

Aquifer Description [1] ____________________
Aquifer Setting [1] ____________________
County(ies) (optional) [2] ____________________
Longitude/Latitude (optional) [3] ____________________
Data Reporting Period [4] ____________________

Source Type	Present in reporting area (circle) [5]	Number of sites in area	Number of sites that are listed and/or have confirmed releases	Number with confirmed ground water contamination	Contaminants[6]	Number of site investigations (optional)	Number of sites that have been stabilized or have had the source removed (optional)	Number of sites with corrective action plans (optional)	Number of sites with active remediation (optional)	Number of sites with cleanup completed (optional)
NPL	Yes/No									
CERCLIS (non-NPL)	Yes/No									
DOD/DOE	Yes/No									
LUST	Yes/No									
RCRA Corrective Action	Yes/No									
Underground Injection	Yes/No									
State Sites	Yes/No									
Nonpoint Sources[7]	Yes/No									
Other (specify)	Yes/No									
Totals [8]										

NPL - National Priority List
CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOE - Department of Energy
DOD - Department of Defense
LUST - Leaking Underground Storage Tanks
RCRA - Resource Conservation and Recovery Act

Instructions/Notes for Table 8-2

1. Identify the aquifer and hydrogeologic setting by describing the unit in as much detail as necessary to distinguish it from other aquifers in the State. The description needs to be sufficient to enable tracking from one reporting period to another. Some potential descriptors to consider may be the name, location, composition, and depth to the top and bottom of the aquifer. If desired, States may append a map illustrating the general location of the selected aquifer or hydrogeologic setting.

2. Indicate, if desired, the county(ies) in which the aquifer or hydrogeologic setting is located. This information will ultimately be input into a GIS database to allow (a) manipulation of the data, and (b) presentation of the general locations of aquifers that are being studied or monitored.

3. Indicate, if desired, the approximate location of the aquifer or hydrogeologic setting. This information is being requested to enable EPA to fix the general location of the aquifer on maps. States may opt to supply a map illustrating the general location of the aquifer or the longitude and latitude of the approximate center of the aquifer.

4. Record the reporting period. For purposes of this table, it is assumed that the data were collected over a single time frame. If this is not the case, please indicate in a note at the bottom of the table the appropriate time frames for each data source.

5. Indicate if the types of sites shown in Table 8-2 are present in the reporting area by circling yes or no.

6. Indicate the contaminants of concern that have impacted ground water quality. It is not necessary to list every contaminant that has been detected. Instead, States are encouraged to list the contaminants of primary concern.

7. Potential source types may include nonpoint sources as well as point sources. Potential nonpoint source types that States may consider include agricultural sites, septic systems, and industrial contamination of unknown origin.

8. Indicate the total number of sites in each of the categories listed in Table 8-2. If the exact number of sites is not known, States are encouraged to estimate the numbers of sites. Note that in some cases, the information requested is optional and need not be entered. Complete Table 8-2 by totaling the number of sites in each of the categories.

EPA encourages States to report the type and number of sites present within the reporting area, the number of sites that are listed or have confirmed releases, and the number of sites with confirmed ground water contamination. If the exact number of sites is not known, States are encouraged to indicate whether any sites are present in the reporting area by responding "yes" or "no" and/or by estimating the numbers of sites. If desired, Table 8-2 also provides the opportunity for States to report the status of actions being taken to address ground water contamination.

Overview of State Ground Water Protection Programs

In previous 305(b) reports, States were asked to provide a narrative description of ground water protection programs. This information provides an overview of legislation, statutes, rules, and/or regulations that are in place. It also provides an indication of how comprehensive ground water protection activities are in the State. For 1996, EPA requests this information in a table format to more uniformly summarize and characterize the information provided. EPA requests each State to complete and submit Table 8-3 as part of their 305(b) reports. Instructions are included on page 8-10.

States are especially encouraged to provide a narrative describing significant new developments in State ground water protection efforts and the implementation status of their ground water protection programs and activities. The narrative may include changes that have occurred since the last 305(b) reporting cycle that States wish to highlight, such as development of an aquifer classification system, development of ground water standards to protect against land use practices, or improved coordination between State agencies. The narrative may also include a discussion of programs that warrant further development and implementation. Specifically, what are the problems associated with a given program, what solutions have been identified, and what, if any, impediments exist to implementing the solutions.

If desired, States may also consider using nondirect indicators to illustrate new developments in ground water protection programs. For example, States may detail changes in pesticide usage, landfill design and remediation, or underground storage tank practices that led to the elimination of potential ground water pollution threats, improvement of site conditions, or decreases in potential contaminant migration.

Each State is encouraged to provide examples of the successful application of the State's programs, regulations, or requirements; a description of a specific survey or major study; or some other activity that demonstrates the State's progress toward protecting the ground water resources.

Table 8-3. Summary of State Ground Water Protection Programs

Programs or Activities	Check (✓) (1)	Implementation Status (2)	Responsible State Agency (3)
Active SARA Title III Program			
Ambient ground water monitoring system			
Aquifer vulnerability assessment			
Aquifer mapping			
Aquifer characterization			
Comprehensive data management system			
EPA-endorsed Core Comprehensive State Ground Water Protection Program (CSGWPP)			
Ground water discharge permits			
Ground water Best Management Practices			
Ground water legislation			
Ground water classification			
Ground water quality standards			
Interagency coordination for ground water protection initiatives			
Nonpoint source controls			
Pesticide State Management Plan			
Pollution Prevention Program			
Resource Conservation and Recovery Act (RCRA) Primacy			
State Superfund			
State RCRA Program incorporating more stringent requirements than RCRA Primacy			
State septic system regulations			
Underground storage tank installation requirements			
Underground Storage Tank Remediation Fund			
Underground Storage Tank Permit Program			
Underground Injection Control Program			
Vulnerability assessment for drinking water/wellhead protection			
Well abandonment regulations			
Wellhead Protection Program (EPA-approved)			
Well installation regulations			

Instructions/Notes for Table 8-3

1. Place a check (✓) in the appropriate column of Table 8-3 for all applicable State programs and activities.

2. Briefly indicate the implementation status for each of the programs. Terms that may be used to describe implementation status are "not applicable," "under development," "under revision," "fully established," "pending," or "continuing efforts." States may wish to describe and further explain the implementation status of special programs or activities and the terms used in completing Table 8-3 in the accompanying narrative.

3. Indicate the State agency, bureau, or department responsible for implementation and enforcement of the program or activity. If multiple agencies are involved in the implementation and enforcement of a program or activity, provide the lead agency followed by an asterisk (*) to indicate involvement of multiple agencies.

Summary of Ground Water Quality

EPA encouraged States to provide a description of overall ground water quality in previous 305(b) reports. Due to the expense involved in collecting ambient ground water monitoring data, a comprehensive evaluation of the resources was not possible and States generally described ground water quality as ranging from "poor" to "excellent." Although these descriptors were based on best available information, they did not provide an accurate representation of ground water quality and it became evident that a series of indicator parameters was necessary to characterize spatial and temporal trends in ground water quality.

Ground water indicators have been under development for some time, with each succeeding 305(b) reporting period advancing development one step further. The 1994 305(b) reporting period focused on the use of maximum contaminant level (MCL) exceedances in ground-water-based or partial-ground-water-supplied PWSs. The 1996 305(b) reporting period continues to use MCL exceedances in ground-water-based PWSs but also allows the option to use other data that may be available to States. The data used in the assessment will be combined with a spatial component (i.e., aquifer or hydrogeologic setting) to allow States to report information for locations of special interest (e.g., critical ground water usage, high vulnerability, or special case studies).

For 1996, States are encouraged to select aquifers or hydrogeologic settings based on data availability and State-specific priorities. States are encouraged to review the types of monitoring data that are available (e.g., PWS, ambient or other compliance monitoring data), how much data are available, the quality of the data (e.g., confirmed MCL exceedances), and whether the data can be correlated to a specific aquifer or hydrogeologic setting. If data can be correlated to specific aquifers or hydrogeologic settings, States may then consider giving priority to aquifers or hydrogeologic settings that support significant drinking water supplies and/or are sensitive to land use practices. If data cannot be correlated to specific aquifers or hydrogeologic settings for 1996, States should consider developing plans and mechanisms to report the information in future 305(b) reporting cycles. EPA recognizes that reporting data for specific aquifers or hydrogeologic settings within States is new and that there will be significant variability in the information that States will be able to provide in 1996. EPA suggests that States assess ground water quality within specific aquifers or hydrogeologic settings with a goal of assessing approximately 75 percent of the State during a 10-year period.

As noted earlier, EPA recognizes that a single data source for assessing ground water quality does not exist and States are encouraged to use available data that they believe best reflects the quality of the resource. States may choose to use one or multiple sources of data in the assessment of ground water quality. Several potential data sources have been identified, including:

- Ambient water quality data from dedicated monitoring wells or networks (optional)
- Raw or finished water quality data from ground-water-based public water supply wells
- Raw or finished water quality data from private or unregulated wells (optional).

The exact source(s) of data used by the States to assess ground water quality will depend upon data availability and the judgment of ground water professionals. In the absence of dedicated ground water monitoring wells or networks, States may consider using data collected from PWSs as these data are routinely collected under SDWA and would not necessitate a separate and unique monitoring effort. If States have access to other data sources, they are encouraged to use whatever is appropriate. For example, monitoring data from ambient wells at regulated sites may also be used. States are encouraged to report any occurrences, including MCL exceedances, of the parameters in the classes or categories to obtain a more comprehensive understanding of ground water quality and contamination.

Table 8-4 has been developed as a guide to States to report ground water quality for individual wells. The primary basis for assessing ground water quality is the comparison of chemical concentrations in water collected from these wells to water quality standards. For purposes of this comparison, EPA encourages States to use the maximum contaminant levels defined under SDWA. However, if State-specific water quality standards exist, and constituent concentrations are at least as stringent as the maximum contaminant levels defined under SDWA, State-specific water quality criteria may be used for assessment purposes. States are encouraged to append the State ambient water quality criteria used to assess ground water quality in their 305(b) reports.

Depending upon the results of the comparison, the data are summarized into four parameter groups and entered in one of the columns on Table 8-4 (more explicit instructions follow the table). These groups include volatile organic compounds (VOCs), semivolatile organic compounds (SOCs), nitrates (NO_3), and other constituents. Nitrate is emphasized because of its widespread use, persistence, and relatively high mobility in the environment. Other constituents that States may wish to consider are the indicator parameters developed by the Intergovernmental Task Force on Monitoring Water Quality (ITFM) for monitoring in areas with different types of land uses and sources of contaminants.

Table 8-4. Aquifer Monitoring Data

Aquifer Description [1] ____________________ County(ies) (optional) [2] ____________________

Aquifer Setting [1] ____________________ Longitude/Latitude (optional) [3] ____________________

Data Reporting Period [4] ____________________

Monitoring Data Type	Total No. of Wells Used in the Assessment [5]	Parameter Groups	Number of Wells								
			No detections of parameters above MDLs or background levels		No detections of parameters above MDLs or background levels and nitrate concentrations range from background levels to less than or equal to 5 mg/l.		Parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs and/or nitrate ranges from greater than 5 to less than or equal to 10 mg/L [10]	Parameters are detected at concentrations exceeding the MCLs [11]	Removed from service [12]	Special Treatment [13]	Background parameters exceed MCLs [14]
			ND [6]	Number of wells in sensitive or vulnerable areas (optional)[7]	ND/ Nitrate ≤ 5mg/l [8]	Number of wells in sensitive or vulnerable areas (optional)[9]					
Ambient Monitoring Network (Optional)		VOC									
		SOC									
		NO_3									
		Other [15]									
Raw Water Quality Data from Public Water Supply Wells		VOC									
		SOC									
		NO_3									
		Other [15]									
Finished Water Quality Data from Public Water Supply Wells		VOC									
		SOC									
		NO_3									
		Other [15]									

Table 8-4. (continued)

Monitoring Data Type	Total No. of Wells Used in the Assessment (5)	Parameter Groups	Number of Wells								
			No detections of parameters above MDLs or background levels		No detections of parameters above MDLs or background levels and nitrate concentrations range from background levels to less than or equal to 5 mg/l.		Parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs and/or nitrate ranges from greater than 5 to less than or equal to 10 mg/L (10)	Parameters are detected at concentrations exceeding the MCLs (11)	Removed from service (12)	Special Treatment (13)	Background parameters exceed MCLs (14)
			ND (6)	Number of wells in sensitive or vulnerable areas (optional)(7)	ND/ Nitrate ≤ 5mg/l (8)	Number of wells in sensitive or vulnerable areas (optional)(9)					
Raw Water Quality Data from Private or Unregulated Wells (optional)		VOC									
		SOC									
		NO_3									
		Other (15)									
Other Sources (optional)		VOC									
		SOC									
		NO_3									
		Other (15)									

Major uses of the aquifer or hydrologic unit (optional)(16)	___ Public water supply ___ Private water supply	___ Irrigation ___ Thermoelectric	___ Commercial ___ Livestock	___ Mining ___ Industrial	___ Baseflow Maintenance
Uses affected by water quality problems (optional)(16)	___ Public water supply ___ Private water supply	___ Irrigation ___ Thermoelectric	___ Commercial ___ Livestock	___ Mining ___ Industrial	___ Baseflow Maintenance

Instructions/Notes for Table 8-4

1. Identify the aquifer and hydrogeologic setting by describing the unit in as much detail as necessary to distinguish it from other aquifers in the State. The description needs to be sufficient to enable tracking from one reporting period to another. Some potential descriptors to consider may be the name, location, composition, and depth to the top and bottom of the aquifer. If desired, States may append a map illustrating the general location of the aquifer or hydrogeologic setting selected for this assessment.

2. Indicate, if desired, the county(ies) in which the aquifer or hydrogeologic setting is located. This information will ultimately be input into a GIS database to allow (a) manipulation of the data, and (b) presentation of the general locations of aquifers that are being studied or monitored.

3. Indicate, if desired, the approximate location of the aquifer or hydrogeologic setting. This information is being requested to enable EPA to fix the general location of the aquifer on maps. States may opt to supply a map illustrating the general location of the aquifer or the longitude and latitude of the approximate center of the aquifer.

4. Record the reporting period. For purposes of this table, it is assumed that the data were collected over a single time frame. If this is not the case, please indicate in a note at the bottom of the table, the appropriate time frame for each data source.

5. For the type of monitoring data being used (e.g., raw or finished water quality data from public water supply wells), indicate the total number of wells considered in this assessment. If PWS data are used in the assessment, it is important to note that constituents related to the operation and maintenance of PWS should not be considered in these assessments. Constituents should only be considered in Table 8-4 if they are known to be representative of the source water.

6. Report the total number of wells for which anthropogenic constituents are not detected at concentrations above the method detection limits (MDLs) <u>and</u> for which naturally occurring constituents are consistent with background levels.

7. For wells that are located in either sensitive or vulnerable areas, report the total number for which anthropogenic constituents are not detected at concentrations above the method detection limits <u>and</u> for which naturally occurring constituents are consistent with background levels.

8. Report the total number of wells for which anthropogenic constituents are not detected at concentrations above the method detection limits <u>and</u> for which naturally occurring constituents are consistent with background levels <u>but</u> nitrate concentrations range from background levels to less than or equal to 5 mg/L.

Instructions/Notes for Table 8-4 (continued)

9. For wells that are located in either sensitive or vulnerable areas, report the total number for which anthropogenic constituents are not detected at concentrations above the method detection limits and for which naturally occurring constituents are consistent with background levels but nitrate concentrations range from background levels to less than or equal to 5 mg/L.

10. Report the total number of wells for which anthropogenic constituents are detected at concentrations that exceed the method detection limits but are less than or equal to the MCLs and/or nitrate is detected at concentrations that range from greater than 5 to less than or equal to 10 mg/L.

11. Report the total number of wells for which concentrations of anthropogenic constituents are confirmed one or more times at levels exceeding the MCL.

12. Report the total number of wells that have been either temporarily or permanently abandoned or removed from service or deepened due to ground water contamination.

13. Report the total number of wells requiring additional or special treatment (e.g., Best Available Technologies, blending). Special treatments would include chlorination, fluoridation, aeration, iron removal, ion exchange, and lime softening if these are necessary to remove contamination from the source water and not caused by the treatment or distribution system itself.

14. Report the total number of wells that have concentrations of naturally occurring constituents that exceed MCLs.

15. Other parameters that States may consider include metals, total dissolved solids, odor, turbidity, or indicators as developed by the ITFM.

16. Check the major use(s) of water of the aquifer or hydrogeologic unit and the use(s) that have been affected by water quality problems.

The secondary basis for assessment is natural sensitivity of the aquifer and/or vulnerability to land-use practices.[1] This information may be reported when monitoring data are scarce or nitrate analyses are the only data available. Information that may be considered by ground water professionals may include known or suspected land-use practices that threaten ground water quality (e.g., landfills, industrial facilities, pesticide applications), documented cases of ground water contamination, trends in the number of each cases, and actions being taken to address contamination. The exact information used and its interpretation is left to the judgment of the State ground water professionals.

The third basis for assessment is the additional information States may have available that relates to ground water quality. For example, the number of wells abandoned or deepened in response to ground water contamination is an indication of the degradation of the resource. In addition, although wells with elevated concentrations of naturally occurring constituents are not necessarily a reflection of the degradation of the resource, they are included in Table 8-4 because they are important to recognize and address as part of water quality planning.

It is important to note that Table 8-4 was developed by EPA and States to (1) provide guidance to States in assessing ground water quality, (2) promote consistency among States in reporting information on ground water quality, and (3) provide a means to compare results reported by States on a national basis. The columns will not be assigned any type of use-support designation for purposes of the 1996 305(b) reporting cycle. Furthermore, the information supplied by States will not be used to assess the quality of the aquifer or hydrogeologic setting as a whole, but will be used to assess the quality of ground water collected from a monitoring point within the designated aquifer or hydrogeologic setting.

Summary of Ground Water-Surface Water Interactions

Nationwide, many water quality problems may be caused by ground water-surface water interactions. Substantial evidence shows it is not uncommon for contaminated ground water to discharge to and contaminate surface water. In other cases, contaminated surface water is seeping into and contaminating ground water.

EPA developed Table 8-5 to be used by States to begin reporting information on significant water quality problems resulting from ground water-surface water interactions. Table 8-5 is intended for use in cases where ground water contamination of surface water or surface water contamination of ground water

[1] State definitions of vulnerability and sensitivity should be consistent with State Management Plans (U.S. EPA, *Assessment, Prevention, Monitoring, and Response Components of State Management Plans, Appendix B*, Office of Prevention, Pesticides, and Toxic Substances, EPA 735-B-93-005c, February 1994).

Table 8-5. Ground Water-Surface Water Interactions (optional)

Aquifer Description (1) ____________________
Aquifer Setting (1) ____________________
Name of Surface Water Body (2) ____________________
Size of Area Affected (3) ____________________
County(ies) (4) ____________________
Longitude/Latitude (5) ____________________
Data Reporting Period (6) ____________________

Contaminant(7)	Contamination of Surface Water by Ground Water(8)				Contamination of Ground Water by Surface Water(8)			
	Concentration in Surface Water		Concentration in Ground Water		Concentration in Surface Water		Concentration in Ground Water	
	Average	Range	Average	Range	Average	Range	Average	Range

SECTION 9

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Addendum A

Draft Approach for Aquatic Life Use Support (ALUS) Assessments Using Both Biological/Habitat <u>and</u> Physical/Chemical Data

ADDENDUM A

DRAFT APPROACH FOR AQUATIC LIFE USE SUPPORT (ALUS) ASSESSMENTS USING BOTH BIOLOGICAL/HABITAT AND PHYSICAL/CHEMICAL DATA

Addendum A includes for your information, review and comment a concept for making aquatic life use support determinations with both biological/habitat (B/H) data and physical/chemical (P/C) data. The EPA/State 305(b) Workgroup drafted the concept for small rivers and streams to outline a logical, scientifically defensible process for integrating ALUS determinations based on B/H and P/C data. The concept **is not guidance.** It needs further development and the review of outside experts. The guidance described in Section 5.1 should be followed.

In reviewing the draft concept, EPA suggests that reviewers evaluate the process in context of its supporting components—the data description levels and the assessment description levels discussed on pages 5-5 through 5-11. A series of questions that reviewers may wish to address include whether the draft concept

- is a valid one for determining the degree to which the waterbody supports the aquatic life use.
- provides sufficiently standardized procedures and protocols (bioassessment and monitoring protocols, quality assurance/quality control requirements, etc.) to promote consistency in the ALUS determinations among States.
- includes the appropriate case examples on the use of the procedure.

EPA appreciates any suggestions that may be offered to support a process for integrating biological/habitat and physical/chemical data in making ALUS determinations.

5.1.7 ALUS Assessments Using Both Biological/Habitat and Physical/Chemical Data

The following guidelines apply to ALUS determinations for wadable streams and rivers where both B/H and P/C data are available. The guidelines recommend a decision approach that incorporates Assessment Description Levels into the ALUS assessment process as illustrated in Figure 1.

Determine degree of ALUS based on B/H data

↓

Determine an Assessment Description Level for degree of ALUS based on B/H data.

Use Table C-5a; also, take into account size of the waterbody and number of monitoring sites.

(if only B/H data available, go to final box)

Determine degree of ALUS based on P/C data

↓

Determine an Assessment Description Level for degree of ALUS based on P/C data.

Use Table C-5b; also, take into account size of the waterbody and number of monitoring sites.

(if only P/C data available, go to final box)

↘ ↙

Compare findings:

- Degree of ALUS from B/H data
- Degree of ALUS from P/C data
- Assess. Desc. Level for B/H assessment
- Assess. Desc. Level for P/C assessment

↓

Report final degree of ALUS

Figure 1. Process for determining Assessment Description Levels and degree of ALUS for a waterbody

A. Fully Supporting: Full support indicated by both B/H and P/C data

B. Fully Supporting but Threatened: Full support indicated by both data categories, one or both categories indicate an apparent decline in water quality over time or potential water quality problems requiring additional data or verification, or

Other information suggests a threatened determination (see Section 3.2)

C. Partially Supporting: Partial support indicated by both B/H and P/C data categories, or

Full support indicated by either B/H or P/C data and partial support or nonsupport indicated by the other category*

- A determination of partially supporting or not supporting could be made based on the nature of the data and the relative Assessment Description Levels of confidence of the P/C and B/H results. See examples that follow.

D. Not Supporting:Nonsupport indicated by both B/H and P/C data

Examples of ALUS assessments where B/H data and P/C data suggest different assessment results. Table 1 summarizes the results from these examples.

Waterbody EX-1. Cathys Run

a. Benthos survey during a key period using Rapid Biomonitoring Protocols (RBPs) III with a regional reference condition approach, supported by data from fisheries biologists that are of lower Assessment Description Levels -- B/H data indicate Nonsupport

b. Fixed station, monthly P/C monitoring for conventionals and toxicants; limited data at critical flows - data indicate Full Support.

c. Waterbody size = 5 miles; monitoring site is believed to be representative of the entire waterbody

ALUS Determination = Nonsupport

Rationale: Using Tables 5-2 and 5-3, the analyst determines that Assessment Description Levels based on B/H and P/C data are 3 and 2, respectively. The analyst determines that the waterbody is Not Supporting aquatic life use -- although the P/C data indicate attainment of water quality standards, the B/H results indicate severe impairment by non-chemical stressors such as habitat loss or by acute events that were missed by the P/C monitoring.

Waterbody EX-2. Rogue Creek

a. Benthos surveys using Rapid Biomonitoring Protocols (RBPs) III with a regional reference condition approach, supported by data from fisheries biologists that are of lower Assessment Description Level -- B/H data indicate Partial Support;

b. Fixed station, monthly P/C monitoring for conventionals and toxicants; limited data at critical flows; large exceedances of WQC for several metals -- P/C data indicate Nonsupport

c. Waterbody size = 2 miles; single monitoring site is believed to be representative of entire waterbody

ALUS Determination = Nonsupport

Rationale: Using Table 5-2, the analyst determines that the Assessment Description Level based on B/H data is 3. Although "limited data at critical flows," the available P/C data strongly indicate Nonsupport and the analyst determines that the level based on P/C data is also 3. The final ALUS determination is Nonsupport. Note: Actual experience indicates that this is a rare case; generally, B/H data corroborate findings of impairment based on severe violations of P/C criteria.

Waterbody EX-3. Jones Creek

a. Benthos survey during a key period using RBPs III with a regional reference condition approach, supported by data from fisheries biologists that is of lower Assessment Description Level -- B/H data indicate Full Support.

b. Fixed station, monthly P/C monitoring for conventionals and toxicants; limited data at critical flows - metals data indicate Nonsupport based on four values slightly exceeding criteria for total recoverable copper out of 36 monthly samples.

c. Waterbody size = 5 miles; the two monitoring sites are believed to be representative of the entire waterbody.

ALUS Determination = Partially Supporting

Rationale: The analyst determines that the Assessment Description Level for the B/H data is 3. Although the P/C dataset includes data at Level 2, the analyst considers the finding of Nonsupport for the P/C data to be Level 1 because it is based on four values slightly exceeding the criterion for total recoverable copper, a metal with a criterion that is considered conservative regarding bioavailability. The final ALUS determination is Partially Supporting.

NOTE: Assessments that are based mainly on metals tend to be of Assessment Description Levels 2 or 1 because of sampling methods commonly employed. For example, for chemical parameters collected by grab sampling, confidence in a Full Support determination may be low because this sampling method tends to miss acute events. This is particularly significant if an acute event occurs during a key biological period (e.g., fish spawning). However, greater confidence in assessments is possible for metals if criteria are repeatedly exceeded by a great margin. Or, pertinent to the above example, a higher Assessment Description Level would be assigned to the metals data if there were additional evidence regarding the persistence and/or biological significance (e.g., bioavailability analyses for the waterbody) of low level exceedances in this waterbody. Under this scenario, an ALUS determination of Nonsupport would be likely.

Waterbody EX-4. Smith Brook

a. Benthos survey using RBP II during key season -- B/H data indicate Full Support

b. Fixed-station, monthly P/C monitoring for conventionals and toxicants; limited data at critical flows - DO data indicate Partial Support based on several DO values below State standards.

c. Waterbody size = 12 miles; single monitoring site may not be representative of the entire waterbody

ALUS Determination = Partial Support

Rationale: From Tables 5-2 and 5-3, the Assessment Description Levels based on the B/H data and the P/C data would each be 2 if the analyst had a high degree of certainty that the site were representative of the entire waterbody. However, the analyst reports both Assessment Description Levels as 1 based on having only a single monitoring site in the entire 12 miles. The final determination is that the waterbody is Partially Supporting aquatic life use.

Waterbody EX-5. S. Fork Smith Brook

a. Benthos survey using RBPs II during key period -- B/H data indicate Full Support

b. Fixed-station, monthly P/C monitoring for conventionals and toxicants; limited data at critical flows - DO data indicate Nonsupport based on severe violations of State standards.

c. Waterbody size = 2 miles; monitoring sites believed to be representative of entire waterbody

ALUS Determination = Nonsupport

Rationale: The Assessment Description Level for the B/H data is 2. The analyst determines that the P/C finding of Nonsupport rates a confidence level of 3 because the DO data are comprehensive and show severe violations. The analyst determines that the final ALUS Assessment Description Level is 2 because of the unexplained difference in B/H and P/C findings. The ALUS determination is Nonsupport.

Table 1. Summary of ALUS findings for the above examples[a]

Waterbody ID	Waterbody Name	Degree of Use Support Suggested by B/H Data	B/H Assess. Descrip. Level	Degree of Use Support Suggested by P/C Data	P/C Assess. Descrip. Level	ALUS Assessment
EX-1	Cathys Cr.	Nonsupport	3	Full Support	2	Nonsupport
EX-2	Rogue Cr.	Partial Support	3	Nonsupport	3	Nonsupport
EX-3	Jones Cr.	Full Support	3	Nonsupport	1	Partial Support
EX-4	Smith Brook	Full Support	1	Partial Support	1	Partial Support
EX-5	S. Fork Smith Brook	Full Support	2	Nonsupport	3	Nonsupport

[a] WBS will contain each of these use support and assessment description data fields. EPA encourages States to store this information for each appropriate small riverine waterbody.

Appendix A

Provisions of the Clean Water Act

APPENDIX A

PROVISIONS OF THE CLEAN WATER ACT

Section 305. Water Quality Inventory

(b)(1) Each State shall prepare and submit to the Administrator by April 1, 1975, and shall bring up to date by April 1, 1976, and biennially thereafter, a report which shall include--

(A) a description of the water quality of all navigable waters in such State during the preceding year, with appropriate supplemental descriptions as shall be required to take into account seasonal, tidal, and other variations, correlated with the quality of water required by the objective of this Act (as identified by the Administrator pursuant to criteria published under section 304(a) of this Act) and the water quality described in subparagraph (B) of this paragraph;

(B) an analysis of the extent to which all navigable waters of such State provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water;

(C) an analysis of the extent to which the elimination of the discharge of pollutants and a level of water quality which provides for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allows recreational activities in and on the water, have been or will be achieved by the requirements of this Act, together with recommendations as to additional action necessary to achieve such objectives and for what waters such additional action is necessary;

(D) an estimate of (i) the environmental impact, (ii) the economic and social costs necessary to achieve the objective of this Act in such State, (iii) the economic and social benefits of such achievement, and (iv) an estimate of the date of such achievement; and

(E) a description of the nature and extent of nonpoint sources of pollutants, and recommendations as to the programs which must be undertaken to control each category of such sources, including an estimate of the costs of implementing such programs.

(2) The Administrator shall transmit such State reports, together with an analysis thereof, to Congress on or before October 1, 1975, and October 1, 1976, and biennially thereafter.

Sec 106. Grants For Pollution Control Programs

(e) Beginning in fiscal year 1974 the Administrator shall not make any grant under this section to any State which has not provided or is not carrying out as a part of its program--

(1) the establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor, and to compile and analyze data on (including classification according to eutrophic condition), the quality of navigable waters and, to the extent practicable, ground waters including biological monitoring; and provision for annually updating such data and including it in the report required under section 305 of this Act;

Section 204. Limitations and Conditions

(a) Before approving grants for any project for any treatment works under section 201(g)(1), the Administrator shall determine--

(2) that (A) the State in which the project is to be located (i) is implementing any required plan under section 303(e) of this Act and the proposed treatment works are in conformity with such plan, or (ii) is developing such a plan and the proposed treatment works will be in conformity with such plan, and (B) such State is in compliance with section 305(b) of this Act.

Section 303. Water Quality Standards and Implementation Plans

(d)(1) (A) Each State shall identify those waters within its boundaries for which the effluent limitations required by Section 301(b)(1)(A) and Section 301(b)(1)(B) are not stringent enough to implement any water quality standard applicable to such waters. The State shall establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters.

(B) Each State shall identify those waters or parts thereof within its boundaries for which controls on thermal discharges under Section 301 are not stringent enough to assure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife.

(C) Each State shall establish for the waters identified in Paragraph (1)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load, for those pollutants which the Administrator identified under Section 304(a)(2) as suitable for calculation. Such load shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.

(D) Each State shall estimate for the waters identified in Paragraph (1)(B) of this subsection the total maximum daily thermal load required to assure protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife . . ."

(d)(2) Each State shall submit to the Administrator, from time to time, with the first submission not later than one hundred and eighty days after the date of publication of the first identification of pollutants under Section 304(a)(2)(D), for his approval the waters identified and the loads established under Paragraphs (1)(A), (1)(B), (1)(C), and (1)(D) of this subsection . . ."

NOTE: EPA published final revisions to 40 CFR 130.7 (the regulations implementing Section 303(d)) in the Federal Register on July 24, 1992. The revisions define "from time to time" as a biennial reporting requirement for submitting prioritized lists of water quality-limited waters. (Note that the regulatory revisions pertain exclusively to 303(d) lists of waters requiring TMDLs and do not require biennial submittals of TMDLs). The regulations also specify that the State submittals under Section 303(d) coincide with State Submittals under Section 305(b) and may be submitted as part of the 305(b) report. From the 303(d) regulations:

"(d) Submission and EPA approval.

(1) Each State shall submit biennially to the Regional Administrator, beginning in 1992, the list of waters, pollutants causing impairment, and the priority ranking including waters targeted for TMDL development within the next two years as required under Paragraph (b) of this section. For the 1992 biennial submissions, these lists are due no later than October 22, 1992. Thereafter, each State shall submit to EPA lists required under Paragraph (b) of this section on April 1 of every even-numbered year. The list of waters may be submitted as part of the State's biennial water quality report required by Section 130.8 of this part and Section 305(b) of the CWA or submitted under separate cover."

Section 314. Clean Lakes

(a) Each State shall prepare or establish, and submit to the Administrator for his approval--

(A) an identification and classification according to eutrophic condition of all publicly owned lakes in such State;

(B) a description of procedures, processes, and methods (including land use requirements), to control sources of pollution of such lakes;

(C) a description of methods and procedures, in conjunction with appropriate Federal agencies, to restore the quality of such lakes;

(D) methods and procedures to mitigate the harmful effects of high acidity, including innovative methods of neutralizing and restoring buffering capacity of lakes and methods of removing from lakes toxic metals and other toxic substances mobilized by high acidity;

(E) a list and description of those publicly owned lakes in such State for which uses are known to be impaired, including those lakes which are known not to meet applicable water quality standards or which require implementation of control programs to maintain compliance with applicable standards and those lakes in which water quality has deteriorated as a result of high acidity that may reasonably be due to acid deposition; and

(F) an assessment of the status and trends of water quality in lakes in such State, including but not limited to, the nature and extent of pollution loading from point and nonpoint sources and the extent to which the use of lakes is impaired as a result of such pollution, particularly with respect to toxic pollution.

(2) Submission as part of 305(b)(1) Report.--The information required under paragraph (1) shall be included in the report required under section 305(b)(1) of this Act, beginning with the report required under such section by April 1, 1988.

Appendix B

305(b) Reporting for Indian Tribes

APPENDIX B

305(b) REPORTING FOR INDIAN TRIBES

EPA encourages Tribes and Tribal groups with monitoring and assessment programs to submit 305(b) reports. Benefits of participating in the 305(b) process include

- The Tribe assesses its monitoring data in a way that is meaningful to decisionmakers.
- The 305(b) report is a public information tool documenting Tribal actions to protect waterbodies.
- The report calls national attention to special issues such as fish tissue contamination from toxic chemicals and ground water contamination.
- The process offers an opportunity for Tribal and State technical staff to coordinate assessments.
- The 305(b) report is a good vehicle for recommending actions to EPA to achieve the objectives of the Clean Water Act and protect Tribal waterbodies.

This appendix describes a level of reporting that may be appropriate for a Tribe's first-time 305(b) report. For details about the various topics, see the main body of this Guidelines document. **In addition, EPA has prepared a booklet about Tribal 305(b) reporting -- *Knowing Our Waters: Tribal Reporting Under Section 305(b)* (EPA, 1995). The booklet is available from the EPA Regional 305(b) Coordinators listed inside the front cover of these Guidelines.**

If all topics cannot be covered in a Tribal 305(b) report, EPA encourages Tribes to present available information in whatever form is appropriate -- tabular, narrative, or graphical (map) format. EPA also encourages Tribes to coordinate with State and Federal water quality agencies including the EPA Regions on topics such as assessment methods, data sharing, and common boundary waters. Each State and EPA Region has a 305(b) Coordinator. State, Territory, and Tribal 305(b) Coordinators are listed inside the back cover of these Guidelines.

It may be mutually beneficial for Tribes and States to collaborate on assessments and reporting. For example, common assessments would be appropriate for shared water resources. Opportunities for collaboration would need to be evaluated by each Tribe on a case-by-case basis.

Following are the major sections and contents of a Tribal 305(b) report. If the terms are not familiar to you, please refer to Sections 3 through 5 of the main body of these Guidelines and to *Knowing Our Waters: Tribal Reporting under Section 305(b)* (EPA, 1995).

EXECUTIVE SUMMARY/OVERVIEW

Provide a brief narrative overview of surface and ground water quality on Tribal lands, including:

- Summary of degree of designated use support
- Causes (pollutants/stressors) and sources of water quality impairments
- Programs to correct impairments
- Monitoring programs, issues of special concern, and Tribal initiatives
- A map showing reservation boundaries, waterbodies, monitoring sites

BACKGROUND

Complete as much of the Atlas table (Table B-1) as possible.

SURFACE WATER ASSESSMENT

Surface Water Monitoring Program

- Brief description of the program including:
  - Monitoring design used by the Tribe (e.g., fixed stations; toxics monitoring; biological monitoring)
  - Parameters (e.g., pollutants) and sampling frequency for each type of monitoring
  - References for written protocols (field, lab, assessment)
  - Description of quality assurance/quality control (QA/QC) program
  - Data management
  - Changes in program since last assessment
  - Reporting other than 305(b)

- Cooperative efforts with State and Federal agencies
- Training received and given
- Volunteer monitoring

Assessment Methodology and Water Quality Standards

- Description of methods to assess water quality data for use support (fully, partially, not supporting); use of a detailed flow chart is encouraged. See Sections 3 - 5 of these Guidelines for recommended approaches.
- Description of water quality standards used for assessments, including Tribal standards

Water Quality Assessment Summary

- For streams and rivers, complete Tables B-2, B-3, and B-4 for all appropriate designated uses, causes, and sources of impairment. If mileage cannot be quantified, describe causes and sources in narrative form. (See *Knowing Our Waters* for examples; see Section 3 of these Guidelines for details).
- For lakes, prepare tables similar to Tables B-2, B-3, and B-4 for all appropriate designated uses, causes, and sources of impairment. Use units of acres; if acreage cannot be quantified, describe causes and sources in narrative form.
- Provide map/maps color coded or shaded to show degree of use support (full, partial, threatened, not supporting) for waterbodies on Tribal lands. Show designated uses of importance to the Tribe for which data are available (e.g., aquatic life, fish consumption, swimming)
- For other waterbody types such as estuaries or coastlines for which assessments are available, report in narrative form or in tables similar to Tables B-2, B-3, or B-4.
- If information is available on wetlands (extent, degree of use support, or impairment), report using tables from Section 7 (Part III Chapter 6) of the Guidelines or in narrative form; report on any wetland protection activities in narrative form

Public Health/Aquatic Life Concerns

To the extent possible, provide information on the public health and aquatic life impacts of toxicants and non-toxic contamination including:

- Significant impairments from point and nonpoint sources
- Areas of special concern due to toxics in fish tissue
- Pollution-caused fish kills/abnormalities
- Sites of known sediment contamination
- Restrictions on surface drinking water supplies
- Incidents of waterborne disease during this reporting cycle
- Other aquatic life impacts of pollutants and stressors (e.g., reproductive interference, threatened or endangered species impacts)

Tribes may present this information in narrative or tabular form (see Section 7, Part III/Chapter 7). Tribes are encouraged to discuss the nature and limits of the monitoring effort from which these data were derived, and to place these impacts in perspective as compared to other water quality problems.

Water Quality Inventory

Either in this section or in an appendix, provide a listing or inventory of Tribal waterbodies, including waterbody name, identification number, size, degree of use support, causes, sources, and needed control measures. Table B-5 shows the requested information with examples of waterbody-specific data. Tribes may use EPA's PC Waterbody System (WBS) to track this information and other data for management purposes. Contacts for WBS are the EPA Regional 305(b) Coordinators and John Clifford, EPA National Waterbody System Coordinator, (202) 260-3667.

GROUND WATER ASSESSMENT

Provide narrative or tabular description of ground water aquifers under Tribal lands, including:

- Major uses of ground water from each aquifer (e.g., Tribal- or State-designated uses, if any)
- Numeric ground water standards, if any
- Population using the aquifer
- Summary results of ground water monitoring, by parameter

Tribes should also describe the type and extent of ground water monitoring on tribal lands, including maps if possible. Section 8 of these Guidelines describes recommended indicators for different types of ground water monitoring.

WATER POLLUTION CONTROL PROGRAMS

Provide a narrative overview of point and nonpoint source control programs in whatever level of detail the Tribe chooses. If this information is supplied to EPA elsewhere, briefly summarize those documents. Also, discuss special Tribal concerns and any strategies planned or implemented for addressing these concerns. Give site-specific examples where possible. Finally, provide recommendations to EPA regarding additional actions needed to achieve the objectives of the Clean Water Act and protect tribal waterbodies. Examples include additional monitoring, training in assessment or data management, and improved methods for fish consumption advisories.

Table B-1. Atlas of Tribal Resources (complete to the extent possible)

Topic	Value
Surface area of Tribal lands[a]	
Tribal population residing on these lands	
Total miles of rivers and streams on Tribal lands - Miles of perennial rivers/streams (subset) - Miles of intermittent (non-perennial) streams (subset) - Miles of ditches and canals (subset) - Border miles of shared rivers/streams (subset)	
Number of lakes/reservoirs/ponds on Tribal lands[b]	
Acres of lakes/reservoirs/ponds on Tribal lands[b]	
Acres of freshwater wetlands on Tribal lands	
Acres of tidal wetlands on Tribal lands	
Square miles of estuaries/harbors/bays	
Miles of ocean coast	
Miles of Great Lakes shore	

[a] Please define the boundaries of the land and waters under Tribal jurisdiction and included in this report; use a map and/or text descriptions.

[b] Impoundments should be classified according to their hydrologic behavior, either as stream channel miles under rivers, or as total surface acreage under lakes/ponds, but not under both categories. In general, impoundments should be reported as lakes/reservoirs/ ponds unless they are run-of-river impoundments with very short retention times

Table B-2. Individual Use Support Summary[a]

Type of Waterbody: Rivers and Streams[b]

Use	Size Supporting	Size Supporting but Threatened[c]	Size Partially Supporting	Size Not Supporting	Size Not Attainable	Size Un-assessed
Fish Consumption						
Shellfishing						
Aquatic Life Support						
Swimming						
Secondary Contact						
Drinking Water Supply						
Cultural/Ceremonial Uses						
Agriculture						
Tribe Defined: 1 2 3 4 5 6						

a Prepare one table for rivers and streams, a separate table for lakes, and others for estuaries, coastline and wetlands, as appropriate.

b Reported in miles; in the other tables use acres for lakes, square miles for estuaries, miles for coastal waters, and acres for wetlands.

c Size threatened is a distinct category of waters and is not a subset of the size fully supporting uses. See Section 3.2.

Note: Tribe defined codes should be established for any important uses that are not included above. Examples of such uses could include Outstanding Resource Waters, Aesthetics, and Industry. To the extent possible, attempt to group waters into the eight general categories of use. Where waterbodies have multiple uses, the appropriate waterbody length/area should be entered in each applicable category.

Table B-3. Total Sizes of Impaired Waters, by Cause Category[a]

Type of waterbody: Rivers and Streams[a]

Cause Category	Size of Waters Impaired[b]
Cause unknown	
Unknown toxicity	
Pesticides	
Priority organics	
Nonpriority organics	
Metals	
Ammonia	
Chlorine	
Other inorganics	
Nutrients	
pH	
Siltation	
Organic enrichment/low DO	
Salinity/TDS/chlorides	
Thermal modifications	
Flow alterations	
Other habitat alterations	
Pathogen indicators	
Radiation	
Oil and grease	
Taste and odor	
Suspended solids	
Noxious aquatic plants	
Filling and draining	
Total toxics	
Turbidity	
Filling and draining	
Exotic species	
Other (specify)	

[a] Prepare one table for rivers and streams, a separate table for lakes, and others for estuaries, coastlines, and wetlands as appropriate.

[b]Reported in miles for rivers and streams. When preparing similar tables for other waterbody types, use the following units: lakes, acres; estuaries, square miles; coastal waters and Great Lakes, shore miles; wetlands, acres.

Table B-4. Total Sizes of Impaired Waters Affected by Various Source Categories[a]

Type of Waterbody: (Rivers and Streams)

Source Category	Size of Waters Impaired [b]
Point Sources	
Industrial Point Sources	
Municipal Point Sources	
Agricultural Point Sources (e.g., feedlots)	
Combined Sewer Overflows	
Nonpoint Sources	
Agriculture	
Silviculture	
Construction	
Urban Runoff/Storm Sewers	
Resource Extraction	
Land Disposal	
Hydromodification/Habitat Modification	
Contaminated Sediments [c]	
Atmospheric Deposition	
Unknown Source	
Natural Sources[d]	
Other (specify) [e]	

[a] Prepare one table for rivers and streams, a separate table for lakes, and others for estuaries, coastlines, and wetlands as appropriate.

[b] Reported in miles for rivers and streams. When preparing this table for other waterbody types, use the following units: lakes, acres; estuaries, square miles; coastal waters and Great Lakes, shore miles; wetlands, acres.

[c] Bottom sediments contaminated with toxic or nontoxic pollutants; includes historical contamination from sources that are no longer actively discharging. Examples of contaminants are PCBs, metals, nutrients (common in lakes with phosphorus recycling problems), sludge deposits.

[d] Sources not due to human influence; e.g., naturally-occurring low flow or drought, natural deposits resulting in high metals or salinity. See Section 3 of Guidelines.

[e] List additional sources known to cause impairment.

Note: See Sections 3 and 7 of the full 305(b) Guidelines for more information.

Table B-5. Examples of Waterbody-Specific Assessment Data for Tribal 305(b) Reporting

Waterbody Name	Water-body ID	Description	Total Size[a]	Size Impaired	Designated Use	Degree of Use Support	Causes	Sources	Type of Assessment	Comments
Mill Creek	TT-001	Source to mouth	10 mi	6 mi	Aquat. Life Ceremonial	Nonsupport Nonsupport	DO, pH, nutrients, sediment	Agric., Munic. WWTP	Fixed-station chemical monitoring	Need WWTP upgrade
Sky Lake	TT-002	Entire lake	50 ac	0 ac	Aquat. Life Drink.Water	Full Support Full Support			Creel survey; drinking water data	
Back River	TT-003	Downstream of Giant Mine	50 mi	25 mi	Aquat. Life Fish Consump.	Partial Sup. Nonsupport	Metals, pesticides	Mine tailings, agric.	Fish tissue data; biosurvey	Fish consump. advisory for mercury, lead
Spring Branch	TT-004	Source to mouth	15 mi	15 mi	Aquat. Life Swimming	Nonsupport Full Support	Sediment, nutrients	Agric., streambank modification	Biosurvey; bacteria sampling	Streambank stabilization needed

[a]Use miles for rivers, streams, and coastline; acres for lakes; square miles for estuaries;
WWTP = wastewater treatment plant

Appendix C

Information for Determining Sources

Table C-1. Some Types of Information Useful in Determining Sources of Water Quality Impairment

Source Category	Example Types of Information
Industrial Point Sources	Permit Compliance Records • analysis of DMRs • compliance monitoring or special monitoring in permits • WET or TIE bioassay tests Monitoring/Modeling Studies • upstream/downstream chemical, biological, and habitat monitoring • intensive surveys combined with WLA/TMDL modeling • complaint investigations • data from volunteer monitoring
Municipal Point Sources	Permit compliance records • analysis of routine DMRs • compliance monitoring or special monitoring in permits • WET or TIE toxicity bioassay tests Monitoring/modeling studies • upstream/downstream chemical, biological, or physical monitoring • intensive surveys combined with WLA/TMDL modeling • complaint investigations • data from volunteer monitoring
Combined Sewer Overflows	Permit compliance records • records of nonachievement of targets for frequency of wet weather overflows • implementation of other minimum control and pollution prevention methods (as in EPA CSO Control Policy) Monitoring/modeling studies • upstream/downstream chemical, biological, or physical monitoring comparing wet weather and normal flow conditions • intensive surveys combined with WLA/TMDL modeling • complaint investigations

Source Category	Example Types of Information
Agricultural Point Sources (e.g., CAFOs)	Permit compliance records • Observation of overflows from total retention (non-discharge) facilities • Compliance with provisions for off-site disposal of animal wastes (e.g., land application, composting) Monitoring studies • upstream/downstream chemical, biological, or physical monitoring (especially for nutrients and pathogens) • complaint investigations
Agriculture (NPS)	Information from monitoring and field observations (e.g., to document bad actors) • edge of field monitoring of runoff from animal holding areas, cropped areas, or pastures • monitoring of inputs from irrigation return flows, sub-surface drains, or drainage ditches • proper installation of screens or other measures to avoid fish losses in drainage/irrigation ditches • serious rill or gully erosion in agricultural fields • sedimentation problems in agricultural watersheds • indications of unmanaged livestock in streamside management zones • complaint investigations or data from volunteer monitoring or inventories Records on watershed BMP implementation status • documented low implementation level (e.g., less than a 70% target) of recommended water quality BMPs • documented problems with specific agricultural operators Modeling • Use of such models as AGNPS, SWAT or ANSWERS to estimate pollutant loads and improvement from BMP implementation • intensive surveys combined with WLA/TMDL modeling

Source Category	Example Types of Information
Silviculture (NPS)	Monitoring and field observations documenting instances of high sediment delivery to receiving waters • BMPs not followed on logging road, skid paths, or stream crossings • BMPs not followed to protect streamside management zones • serious sedimentation problems (cobble embeddedness or interstitial D.O. problems) in watersheds that are largely silvicultural Records on watershed BMP/management measure) implementation status • documented low implementation level of recommended water quality-oriented BMPs Results of modeling or cumulative effects analyses • Use of such models as WRENSS to estimate pollutant loads and likely improvement from BMP implementation • Use of water temperature models to help quantify impacts on cold water fisheries • use of landscape analysis techniques (e.g., the RAPID method or Integrated Riparian Area Evaluation method) to document cumulative effects • intensive surveys combined with WLA/ TMDL modeling
Construction	Information from monitoring and field observations (primarily to document problem areas or bad actors) • sedimentation problems documented in watersheds with major construction activity • complaint investigations and volunteer monitoring data Information from sediment control management agencies • records of implementation of sediment control measures

Source Category	Example Types of Information
Urban Runoff & Storm Sewers	Monitoring/modeling studies • upstream/downstream chemical, biological, or habitat monitoring comparing wet weather and normal flow conditions near outfalls • special monitoring for BMP effectiveness-wet ponds, artificial wetlands, grass swales • intensive surveys combined with WLA/ TMDL modeling and catchment models such as SWMM • complaint investigations Information from management agencies • documented low implementation level of recommended/required water quality-oriented BMPs • documented problems with BMP operation and maintenance
Resource Extraction (Petroleum)	Information from monitoring and field observations (primarily to document problem areas or bad actors) • evidence of oil and brine spills affecting sizable areas near receiving waters; elevated TDS, toxicity, oil and grease aesthetic impacts; increased erosion and sedimentation problems • complaint investigations and volunteer monitoring data Information from petroleum management agencies • records of recurrent problems with spills, pipeline breaks, over-berming of reserve pits, waste-hauler dumping
Resource Extraction (mainly surface mining)	Information from monitoring and field observations (primarily to document problem areas or bad actors) • evidence of decreases in pH, toxicity from heavy metals, excessive sedimentation, or stream reaches with iron bacteria in watersheds with active mining • complaint investigations and volunteer monitoring data Information from mining management agencies • records of recurrent permit violations (e.g., over-berming of settling ponds, failure to contain leachates, or failure to revegetate or restore mined areas)

Source Category	Example Types of Information
Land Disposal	Monitoring and field observations (primarily to document problem areas or bad actors) • monitoring indicates leachate migration from disposal area or industrial or domestic leach field failures • complaint investigations and volunteer monitoring Modeling • solute transport or plume models (e.g., PRIZM) indicate high potential for pollutants to reach receiving water
Hydromodification (Dams, flow regulation)	Monitoring and field observations • recurring problems with inadequate instream flows (e.g., dewatering of streams, reduced pollutant assimilation, unnatural water temperatures) • documented interference with fish migration and spawning movements (e.g., for such anadromous fish as salmon or rockfish but also for inland fish that seek spawning habitat outside lakes or large rivers) Modeling • Analysis using PHABSIM or other instream flow models to document adverse impacts • Analysis related to FERC permit renewal and State 401 Certification, habitat recovery plans under the ESA, or TMDL studies (e.g., problems with anoxic or nutrient-laden releases from hydrostructures)
Hydromodification (Channelization, dredging, removal of riparian vegetation, streambank modification, draining/filling of wetlands)	Monitoring (usually over considerable period of time) documenting adverse changes: • severe channel downcutting or widening • elimination of vegetation in streamside management zones • excessive streambank erosion and sloughing • loss of significant wetland area in watershed • failure of wetland mitigation projects Modeling studies • decreases in pollutant assimilation from habitat modification • adverse impacts on hydrology, water temperatures, or habitat

Source Category	Example Types of Information
Natural Sources	Monitoring and field observations of the presence of sources that are clearly not anthropogenic. • Saline water due to natural mineral salt deposits • Low DO or pH caused by poor aeration and natural organic materials • Excessive siltation due to glacial deposits • High temperatures due to low flow conditions or drought Note: the Natural Sources category should be reserved for waterbodies impaired due to naturally occurring conditions.

Appendix D

Data Sources for 305(b) Assessments

APPENDIX D

DATA SOURCES FOR 305(b) ASSESSMENTS

The main purpose of this appendix is to identify data sources that may be useful for assessing use support in State waterbodies, including sources that may not be commonly used by State water quality agencies.

The sources discussed below are Federal and nongovernmental data sources; States will find additional data available from such State agencies as fish and wildlife agencies, State planning offices, departments of health, and others.

D.1 EPA Databases

Table D-1 lists EPA databases that may prove useful for assessing use support in State waterbodies. Each of these systems can be accessed through EPA's National Computer Center mainframe computer. The national data systems in Table D-1 vary in data completeness and data quality; such characteristics should be evaluated for a given State before a system is used for assessing use support. The most complete and reliable national data systems tend to be those in which the State regularly updates information (e.g., STORET, the WBS, and the Permit Compliance System (PCS) in many States), and for which rigorous quality assurance features have been incorporated (e.g., the Reach File and ODES). Most of the information in Table D-1 is taken from the *Office of Water Environmental and Program Information Compendium* FY92, EPA 800-B92-001.

EPA's Assessment and Watershed Protection Division is distributing WBS96 shortly after distribution of these *Guidelines*. EPA specifically designed the WBS to store use support assessments for individual waterbodies and generate summary information requested in this guidance. The WBS differs from other databases in that the WBS does not contain raw data. Instead, the WBS contains use support assessment information resulting from analysis of the raw monitoring data from the States.

D.2 Other Data Sources

Table D-2 lists sources of information available from agencies and organizations other than EPA. Many of these sources are readily available but may not be used by State water quality programs. Many State water quality agencies rely on a combination of EPA data systems and their own systems for acquiring water quality data. Reliable data on rural sources are especially difficult to obtain in many States. The best information often comes from State departments of agriculture, which compile county statistics annually and make them available relatively quickly (e.g., data on crop and livestock production). Data on crop cover, agricultural BMPs, and animal units are typically available only as county summaries, although hard copy files and maps showing exact locations may be available at the Soil and Water Conservation District level.

Databases maintained by the U.S. Department of Interior (DOI) may be of special interest to State water quality agencies; several are listed in Table D-2. The U.S. Geological Survey (USGS) Water Resources Division coordinates USGS databases through its National Water Data Exchange (NAWDEX) Program Office. For more information, States may contact the local NAWDEX Assistance Center in their USGS Water Resources District Office, or call the national NAWDEX Program Office at (703) 648-5684.

The DOI's Fish and Wildlife Service has many relevant monitoring and assessment programs including the National Wetlands Inventory and the National Contaminant Biomonitoring Program. Table D-2 gives brief descriptions and contacts for these and other programs.

The National Oceanic and Atmospheric Administration, through its National Status and Trends Program, assesses the levels of 70 organic chemicals and trace elements in bottom-dwelling fish, sediments and mollusks at more than 300 sites throughout the United States. Table D-2 presents some major components of the Program and contacts.

Table D-1. EPA Data Systems Containing Water Information

Data System	Description	Primary Function	Contact
Waterbody System (WBS) EPA, Office of Wetlands, Oceans, and Watersheds (OWOW)	Database of assessment information drawn from CWA 305(b) activities	Provides waterbody-specific information on pollution causes and sources, use impairments, and status of TMDL development	John Clifford, OWOW (202) 260-3667
Reach File EPA, OWOW	Hydrologic georeferencing and routing system based on USGS digital line graph traces	Integrates many databases having locational information on water quality conditions or pollutant causes	Tommy Dewald, OWOW (202) 260-2488
STORET Water Quality File EPA, OWOW	Data analysis tool for chemical monitoring data from surface and groundwater sites. Also capabilities to store sediment and fish tissue data	Major source of raw ambient data for water quality assessments	Robert King, OWOW (202) 260-7028
STORET Biological System (BIOS) EPA, OWOW	A special component of STORET for storing information on biological assessments	Simplifies storage and analysis of biological data or metrics, with links to other EPA data files	Robert King, OWOW (202) 260-7028
Ocean Data Evaluation System (ODES) EPA, OWOW	Database and analysis system for marine and near coastal monitoring information	Permit tracking system for NPDES discharges to oceans and estuaries and ocean dumping programs	Robert King, OWOW (202) 260-7028
Current Fish Consumption Advisories and Bans EPA, Office of Science and Technology (OST)	National database of fish/shellfish consumption advisories and bans from State 305(b) reports and other sources	Identifies waterbodies, species affected by advisories and bans and the problem pollutants	Jeffrey Bigler, OST (202) 260-1305
Clean Lakes System EPA, OWOW	Data analysis system for significant publicly owned lakes under CWA Section 314 program	Provides data integration using number of EPA data files with mapping capabilities using the Reach File	Watershed Branch, OWOW (202) 260-7074

Table D-1. EPA Data Systems Containing Water Information

Data System	Description	Primary Function	Contact
Permit Compliance System (PCS) EPA, Office of Wastewater Management (OWM)	Locations and discharge characteristics for about 7,100 major and 56,300 minor NPDES facilities	Compliance status tracking system for major dischargers	Dela Ng, (703) 603-8951
Industrial Facilities Discharge File (IFD) EPA, Office of Water	Information for about 120,000 NPDES dischargers; also Superfund sites	Locations, flows and receiving waterbodies, for industrial discharges and POTWs	Robert King, OWOW (202) 260-7028
Facility Index Systems (FINDS) EPA, Office of Information Resources Management	Basic information on over 300,000 facilities regulated by EPA	Starting point for finding regulated facilities in a given area where more detailed information available through other data systems like PCS, TRIS, AIRS, or RCRA	LeAnne Elders (703) 235-5579
Toxic Chemical Release Inventory System (TRIS) EPA, Office of Prevention, Pesticides and Toxic Substances	Database of estimated and measured releases by industries of about 300 toxic chemicals to all environmental media	Inventory of toxic chemical releases with references to receiving waters and methods of waste treatment	Ruby Boyd, OPTS (202) 260-8387
Drinking Water Supply File (DWS) EPA, OWOW	Information on 7,650 public and community surface water supplies	Data on waterbody, flow, and locations of mainly surface water intakes	Robert King, OWOW (202) 260-7028
Federal Reporting Data System (FRDS) EPA, Office of Ground Water and Drinking Water (OGWDW)	Information about public supplies	Detailed data on compliance with Safe Drinking Water Act requirements including monitoring	Larry Weiner, OGWDW (202) 260-2799
Gage File EPA, OWOW	Information on some 36,000 stream gage locations	Summaries of mean annual and critical low flows and other data collected. Sites indexed to Reach File	Robert King, OWOW (202) 260-7028

Table D-1. EPA Data Systems Containing Water Information

Data System	Description	Primary Function	Contact
City and County Files EPA, OWOW	Location information and census data for 53,000 municipalities and all counties	Background data with lists of streams for each city, census population, county land/water area (coastal counties)	Robert King, OWOW (202) 260-7028
Dam File EPA, OWOW	Information on locations of 68,000 damsites and associated reservoirs	Information on ownership, uses of reservoir, size, and stream reach	Robert King, OWOW (202) 260-7028
USGS Land Use and Data Analysis (LUDA) Database EPA, Office of Information Resources Management (OIRM)	USGS database of land use from the 1970s; available through GRIDS on NCC	Contains locations of approximately 40 land use types for entire United States	Robert Pease, OIRM (703) 235-5587
Geographic Resources Information and Data System (GRIDS) EPA, OIRM	A repository for major GIS data layers along with a selection of GIS applications on the EPA NCC mainframe	Provides access to major GIS products from the USGS, Census Bureau and EPA	Robert Pease, OIRM (703) 235-5587

Table D-2. Other Useful Data Sources

Data System	Description	Primary Functions	Contacts
Water Data Storage and Retrieval System (WATSTORE) DOI, USGS, Water Resources Division	Database of water quality data collected at 5,000 stations and peak flow and daily flow data collected at 8,000 stations.	Store data collected by USGS, as well as cooperating agencies in DOI and the Corps of Engineers; good source of ground water data.	Dr. James S. Burton, Chief USGS, Water Resources Division, NAWDEX Program Office (703) 648-5684
National Rivers Inventory, DOI, National Park Service	List of over 1,500 river segments (approximately 63,000 miles).	Identifies waters with potential for National Wild and Scenic Rivers status.	Dan Meyer DOI, National Park Service (202) 343-3780
Rivers and Trails Conservation Assistance Program, DOI, National Park Service	Program supports development and updates to Statewide river inventories or evaluation of particular river corridors or greenways.	Supports Federal and State scenic river programs and a variety of greenway and open space protection initiatives.	Samuel Stokes DOI, National Park Service (202) 343-3780
National Wetlands Inventory, DOI, Fish and Wildlife Service	Computerized mapping scheme for entire United States.	Shows locations of vegetative community types using a FWS classification scheme.	David Dall DOI, Fish and Wildlife Service (703) 358-2201
Emergency Wetlands Resources Act Regional Concept Plans, DOI, Fish and Wildlife Service	Descriptions of priority wetland sites according to value and function prepared by each of the 7 FWS regional offices. Based mainly on State SCORP reports.	To prioritize Federal and State efforts related to the Emergency Wetlands Resources Act of 1986 to promote acquisition or other protection measures for major wetland tracts.	David Dall DOI, Fish and Wildlife Service (703) 358-2201
National Contaminant Biomonitoring Program, DOI, Fish and Wildlife Service	Fish and bird tissue samples collected between 1965 and 1988 for chlorinated pesticides, PCBs, and metals	Fish monitoring done to evaluate the effects of toxicants at 110 freshwater sites in specific watersheds and the Great Lakes.	Branch Chief, Fish Research, National Fisheries Research Center (314) 875-5399

Table D-2. Other Useful Data Sources

Data System	Description	Primary Function	Contacts
National Irrigation Water Quality Program, DOI, Fish and Wildlife Service	Physical, chemical and biological data collected at about 200 areas consisting of about 600 projects.	To identify and address irrigation-induced contamination on DOI irrigation and drainage facilities, National Wildlife Refuges, and other wildlife management areas.	Tim Hall DOI, Fish and Wildlife Service, Division of Environmental Contaminants (703) 358-2148
Biomonitoring of Environmental Status and Trends (BEST) Program, DOI, Fish and Wildlife Service	Data collection to address effects on migratory birds, endangered species, anadromous fish, certain marine mammals, and habitats. Pilot projects through 1995; full implementation in 1996.	Monitor and assess environmental contamination effects to fish and wildlife and their habitats, on and off National Wildlife Refuges.	Tim Hall DOI, Fish and Wildlife Service, Division of Environmental Contaminants (703) 358-2148
National Shellfish Register, Department of Commerce, NOAA, National Ocean Service	Tracks status of shellfish harvesting areas by State at 5-year intervals (most recent data is from 1990).	Detect trends in shellfish growing waters and the abundance of shellfish resources.	Maureen Warren NOAA, National Ocean Service (301) 713-3000
Multi-State Fish and Wildlife Information Systems Project, DOI, Fish and Wildlife Service	Database of life history, habitat needs, and environmental tolerances for inland and marine fish and wildlife.	Central database to facilitate review of permits, regulatory requirements, and ecological preservation or restoration programs.	Rick Bennett DOI, Fish and Wildlife Service (703) 358-1718 OR Andy Loftus Sport Fishing Institute (202) 898-0770

Table D-2. Other Useful Data Sources

Data System	Description	Primary Function	Contacts
National Gap Analysis Project, DOI, Fish and Wildlife Service	Application of GIS technology to prioritize habitat protection needs for specific fish or wildlife species and for overall species protection.	Provides way to identify habitat protection needs based on identification of "gaps" when comparing existing protected areas with regional habitat distributions.	Dr. Ted LaRoe DOI, Fish and Wildlife Service (703) 358-2171
American Rivers Outstanding Rivers List	Database on 15,000 river segments possessing outstanding scenic, recreational and ecological attributes.	Assembles information from National Park Service river surveys, Northwest Power Planning Council's Protected Areas Program, Nature Conservancy Priority Aquatic Sites and other major sources.	Susie Wilkins Outstanding Rivers List (202) 547-6900
Recreation Information Management System, USDA, Forest Service	Database of recreational facilities and areas in National Forest System.	Contains data on types of recreation, visitor days, and participation by activity.	USDA, Forest Service (202) 205-1706
Biological and Conservation Data System, The Nature Conservancy	Listing by States of rare species and key habitat areas.	For identifying waters important for rare plant and animal species protection.	The Nature Conservancy (703) 841-8781
National Water Quality Technology Development Staff (NWQTDS), USDA, Soil Conservation Service	Four regional centers provide database, modeling, and GIS technology assistance to promote the President's Water Quality Initiative, the Farm Bill, and other programs.	Will provide convenient access to soil survey data and a variety of models (e.g., AGNPS) for use with GIS systems to support USDA HUA projects and similar initiatives.	Jackie Diggs USDA, Natural Resources Conservation Service (202) 720-0136

Table D-2. Other Useful Data Sources

Data System	Description	Primary Function	Contacts
Benthic Surveillance Project, National Status and Trends Program, Department of Commerce, NOAA	Sampling at 79 estuarine sites for PCBs, PAHs, chlorinated pesticides, butyltins, sewage tracers, and trace elements.	Determine concentrations of toxic chemicals in sediments and bottom-dwelling fish.	NS&T Program National Ocean Service, NOAA (301) 713-3028
Mussel Watch Project, National Status and Trends Program, NOAA	Mussels and oysters collected annually at about 240 sites and analyzed for same parameters as the Benthic Surveillance Project.	To determine concentrations of toxic chemicals in mussels and similar bivalve mollusks as "sentinel organisms" in environmental monitoring.	NS&T Program National Ocean Service, NOAA (301) 713-3028
Coastal Contamination Assessments, National Status and Trends Program, NOAA	Quick-reference reports for Long Island Sound, Gulf of Maine, Hudson-Raritan area, Narragansett Bay, and Buzzards Bay done or underway.	To identify potential toxicant problems and compare local levels of contamination with national-scale results.	NS&T Program National Ocean Service, NOAA (301) 713-3028
National Estuarine Inventory and Strategic Assessment Program	Source of demographic, economic, and natural resource information for 102 Estuarine Drainage Areas.	Provide data to support NOAA initiatives related to the Sea Grant and Coastal Zone Management Programs.	John P. Tolson National Ocean Service, NOAA (301) 713-3000 Department of Commerce, NOAA (301) 443-8487
Decennial Census	Major source of information with county-level resolution dealing with population, agriculture, mining, etc.	Available in digitized form and, in conjunction with USGS, in a variety of new map forms. Census of agriculture often provides best available data on crop, livestock, and land use patterns.	Charles D. Jones Department of Commerce, Bureau of the Census (301) 763-5180

Appendix E

Section 106 Monitoring Guidance
and
Guidance for Section 303(d) Lists

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 17 1994

OFFICE OF WATER

MEMORANDUM

SUBJECT: Section 106 Monitoring Guidance

FROM: Geoffrey H. Grubbs, Director
Assessment and Watershed Protection Division (4503F)

TO: Regional Water Quality Branch Chiefs
Regional Field Branch Chiefs
Regional Monitoring Coordinators

Attached is the final Section 106 Guidance for Water Quality Monitoring. This has been a long time in the making, as we wanted to be sure the involved and affected parties had ample chance to work with us to make this both a good product and a consensus document likely to be implemented. We have worked on this guidance with members of the Intergovernmental Task Force on Monitoring Water Quality, whose framework for water quality monitoring programs this incorporates, and also with members of the Association of State and Interstate Water Pollution Control Administrators. We have worked with individual State staff, with our Regional Monitoring Coordinators, Water Quality Branch Chiefs and Field Branch Chiefs, and members of various water programs within the Office of Water. In particular, Chuck Kanetsky of Region III put long hours into working with various drafts, and we owe him heartfelt thanks. I thank you all for your comments and involvement.

This 106 monitoring guidance is a key tool in our extensive efforts to work with our partners to improve the water quality monitoring across the country. We are seeking to specifically identify impaired waters across the country. We are seeking to monitor more of our waters, but do so more cost-effectively by employed monitoring techniques appropriate to the condition of and goals for the water. We are seeking greater comparability in monitoring parameters and methods so we can all share data more easily and aggregate it into various geographic scales, from site-specific through watershed, regional and State/Tribal to national. We are seeking to report water quality using common indicators to measure our progress toward meeting our agreed-upon water quality goals. We are seeking to work more closely and share information more easily with our many public and private monitoring partners, especially in a watershed context. This 106 guidance supports all these efforts, and is a tool we can effectively use as we work with States to revitalize monitoring programs and report core information in a comparable fashion.

Section 106 and 604(b) Grant Guidance

Water Monitoring

I. 106/604(b) Monitoring Goals

Overall Goal Develop and implement a surface and ground water monitoring strategy to help achieve the goals and objectives of the Clean Water Act (CWA) and other environmental initiatives. In doing so use a mix of approaches that provide for the design, collection, measurement, storage, retrieval, assessment, and presentation of physical, chemical/toxicological, and biological/ecological data necessary to implement this monitoring efficiently and effectively, making best use of multiple agency resources.

An overall monitoring strategy includes monitoring for the purposes of 1) determining status and trends, 2) identifying causes and sources of problems and ranking them in priority order, 3) designing and implementing water management programs, 4) determining compliance and program effectiveness, and 5) responding to emergencies.

Among other management goals, monitoring supports the development and attainment of water quality standards, 303(d) listings and Total Maximum Daily Load (TMDL) development, NPDES permit limitations, nonpoint source controls, geographic initiatives such as watershed and ecosystem protection, and the measurement of chosen environmental indicators.

Monitoring coverage and design goals. Assess all State waters [surface, ground, and coastal water and wetlands] on a periodic basis (4 - 10 years as negotiated between the Region and the State) using a monitoring design targeted to the condition of and goals for the waters, and incorporating various approaches (e.g. fixed station and synoptic survey, intensive and screening-level monitoring, probability sampling and design). For example, some States use a five-year basin-by-basin monitoring cycle.

Data collection and methods goals. Collect chemical/toxicological, physical, biological/ecological, habitat, and land use/land cover data employing comparable methods with other agencies so as to be able to share data. Use multiple water quality assessment techniques (e.g., fish tissue, population and community surveys, habitat assessments, sediment data, soils and geological data analysis, and toxicity testing) as appropriate to meet the goals and objectives of the monitoring program. Include latitude and longitude with all samples following the guidelines established under EPA's Locational Data Policy. (See Attachment A.)

Environmental indicator goals. Identify specific environmental indicators to measure and report on progress towards achieving the identified program goals.

Data and information sharing goals. Store the data in automated systems that enable data to be easily shared, analyzed, and portrayed. Put appropriate data into EPA's STORET and the Waterbody System.

Analysis and reporting goals. Analyze the data and report it in the State 305(b) report supported by the Waterbody System or comparable database and in other reports tailored to the audiences who need to know the information.

Reference condition goals. Establish ecoregional reference stations for biological monitoring programs in order to provide baseline data for water quality assessments and development of biocriteria.

Collaboration goals. Coordinate planned monitoring activities with existing and planned monitoring programs in other public and private organizations to gain maximum benefit from sharing information.

II. DEFINITIONS

For the purposes of this guidance:

"State" covers States, Indian Tribes, and Territories in this guidance.

"Water quality" refers to physical, chemical/toxicological, and biological/ecological properties of water resources.

"Water resources" include surface and ground waters, coastal waters, associated aquatic communities and habitats, wetlands, and sediment.

"Monitoring activities" include identification of program objectives; selection of indicators; field data collection; laboratory analysis; quality assurance/quality control (QA/QC); data storage, management and sharing; data analysis; and information reporting.

III. PROGRAM ACTIVITIES:

A. Monitoring Strategy States should provide a multi-year (preferably 5-year) monitoring strategy with the 106 grant application. This will provide the framework for Regional/State agreement on an annual monitoring workplan. For this the State can develop or revise its existing water monitoring strategy in consultation with EPA Regional monitoring staff and other affected State program managers. The strategy should be consistent with related program goals. To the extent possible, use information already available, such as 305(b) report information.

Ambient and program-specific. The strategy should include both ambient and program-specific monitoring. States should summarize all program-specific monitoring activities such as for nonpoint source, lakes, estuaries, wetlands, groundwater (for which soil and geology characterization is important), and wet weather surveys (CSO/stormwater), NPDES, TMDL, 305(b) and 403(c) and describe how the ambient and program-specific monitoring programs are integrated to provide the total body of information necessary to support water quality management programs.

B. **Monitoring Program Workplan.** States should describe their monitoring program in the context of their multi-year monitoring strategy, or revise the overall strategy as needed each year to specify annual activities. The goal is to integrate information from existing reports (305(b), QAPPs, methods manuals) to avoid and eventually eliminate, duplication. Where possible, the monitoring workplan should include the following elements:

1. Purpose

a. Goals. List the goals of your monitoring program, the specific objectives or questions you are trying to answer, and who needs the information.

b. Data quality objectives. Specify data quality objectives (a statement of the quality of environmental information necessary to support the goals you identify). See Attachment B for list of available EPA guidance on quality assurance plans.

c. Boundary delineation. If other than the entire State, identify the boundaries of geographic areas you target for monitoring, such as watersheds or waterbodies, and the time frames in which you will monitor them.

d. Environmental Indicators. Identify the parameters or suites of physical, chemical, biological and habitat parameters you are measuring to determine if you are achieving your goals. Where possible, include the indicators developed by the Office of Water to measure national water goals.

e. Reference conditions. Establish reference conditions for environmental indicators that can be monitored to provide a baseline water quality assessment.

2. Coordination/Collaboration. Identify other agency programs (e.g., nonpoint source, Clean Lakes, RCRA, EMAP/REMAP etc.) or other separate agencies or groups (such as USGS, NOAA, or the Nature Conservancy) with similar monitoring goals or information you can use to support your management goals, and discuss how you will collect and/or share information with them.

3. Design and Implementation.

   a. Identify existing water quality problems and information gaps.

   b. Develop timelines to accomplish program objectives.

   c. Identify who is to collect, analyze, interpret, and receive the water quality information.

   d. Identify sampling approach (including fixed station, synoptic, event sampling, intensive surveys) for biological/ecological, physical, chemical/toxicological, and habitat indicators.

      Describe the approaches used, including the number of surveys planned to be initiated or completed during the fiscal year and for each:

      1. Stream (or basin) name and study and station locations.
      2. Objective(s) of study;
      3. Parameters monitored (physical, chemical/toxicological, biological/ecological, habitat)
      4. Sampling frequency of parameters
      5. Reference to method of data collection and analysis;
      6. Reference to appropriate quality assurance project plan;
      7. Final report date.

   e. Specify data collection methods.

      1. A Standard Operating Procedures manual should be prepared and submitted to the Regional Quality Assurance Officer to document collection methodologies.

      This manual should identify field methods, including sampling procedures for physical, chemical/toxicological, biological/ecological, and habitat monitoring activities.

Report any modification to collection methods or problems associated with the implementation of the methods to the Regional Quality Assurance Officer.

2. Ensure that all data is accompanied by the latitude and longitude at which it was collected (see Attachment A) to allow better sharing of data and integration into spatial analysis systems such as Geographic Information Systems (GIS).

f. Provide laboratory analytical support.

1. Provide for laboratory analytical support. Employ laboratory analytical methods comparable with the requirements of 40 CFR, Part 136, as revised in October 1991.

2. State Laboratory personnel should continue participation in EPA's Performance Evaluation studies.

g. Prepare quality assurance and quality control plans.

1. Review, revise, and implement the existing Quality Management Plans (QMP) and Quality Assurance Project Plans (QAPP) to reflect the most effective parameters and methods, including those for conventional parameters, toxicity testing, biological surveys, fish tissue analysis, habitat surveys and sediment collection and analytical protocols. State QMP and QAPP must be implemented in a manner consistent with EPA regulations (see Attachment B), Regional Grant conditions and EPA's Guidelines.

For QA management plans, use guidance provided in EPA's "Interim Guidelines for Preparing Quality Assurance Program Plans" QAMS-00480 or its updated version "EPA Requirements for Quality Management Plans," EPA QA/R-2. (Choice of documents currently dependent on the specific EPA Region Policy).

For QA project plans, use guidance provided in EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80 or its updated version "EPA Requirements for Quality Assurance Project

Plans," EPA QA/R-5. (Choice of documents currently dependent on the specific EPA Region Policy). (See the new referenced documents listed in Attachment B).

All QMP and QAPP revisions undertaken during the fiscal year should be submitted to the Regional Office for review and approval. Also, any problems encountered in implementing the approved QMP and QAPP should be reported. States should submit an annual QA report as part of their end-of-year report to include any problems encountered in implementing the approved QMP and QAPPs.

h. Provide for data storage, management and sharing

1. Store quality-assured data in a computerized database that will enable data to be easily accessed and shared. Provide hardcopy of monitoring data within a reasonable time if requested.

2. All monitoring data should be accompanied by appropriate latitude/longitude information according to EPA's Locational Data Policy. (See Attachment A.) This will allow GIS portrayal and analysis.

3. Water quality monitoring data should be entered into STORET within 3 - 6 months after data collection and analysis.

4. Fish tissue data (both freshwater and saltwater) should be entered in Ocean Data Evaluation System (ODES).

5. Toxicity test data should be entered into ODES or comparable database.

i. Provide training and support.

1. Ensure necessary training of staff for field and laboratory activities, data management, and data assessment.

2. Provide support for volunteer monitoring programs. Volunteer monitoring is valuable for two reasons: 1) education and stewardship and 2) provision of useful screening or other data if volunteers are appropriately trained.

Where volunteer data is to be used for government decision-making, a quality assurance plan should be prepared by the volunteer group and reviewed for approval by the appropriate State agency.

4. Interpretation and Communication

a. Report all assessments of waterbodies for designated use support including causes and sources of impairments in the section 305(b) Waterbody System or upload such information from a compatible State system on an annual basis.

b. In order to use the section 305(b) assessment information for GIS and other spatial analyses, States should move towards georeferencing the waterbodies identified in the Waterbody System. States should reference the waterbodies with reach numbers at the Reach File 3 level. EPA support is available.

c. Identify waters where water quality is known or suspected of being impaired due to any physical, chemical, or biological stressor and report such information as appropriate in the 1996 305(b) report and its supporting Waterbody System. This report should be consistent with and draw upon the information from reports in accordance with the Clean Lakes (314), Nonpoint Source (319), TMDL (303(d)) and other appropriate assessment programs.

d. Work with your Region to have accessible annually information on all final and ongoing monitoring reports, site-specific evaluations, biological surveys and special monitoring projects. The information should include the study objective, contact name, location of study, and reference to the associated QA project plan.

5. Program Evaluation

a. Annually review and update where necessary the State monitoring strategy, workplan, and quality assurance management and project plans.

b. Provide a brief (no more than two pages) assessment of the effectiveness of the monitoring program in providing data suitable to meet program objectives as set forth in the State monitoring strategy (e.g. what changes are needed in the monitoring program to evaluate new or emerging problems or meet objectives that were not achieved). Include a list of the other programs and agencies with which you have coordinated to obtain your monitoring information.

CHAPTER 13 - LOCATIONAL DATA

1. PURPOSE. This policy establishes the principles for collecting and documenting latitude/longitude coordinates for facilities, sites and monitoring and observation points regulated or tracked under Federal environmental programs within the jurisdiction of the Environmental Protection Agency (EPA). The intent of this policy is to extend environmental analyses and allow data to be integrated based upon location, thereby promoting the enhanced use of EPA's extensive data resources for cross-media environmental analyses and management decisions. This policy underscores EPA's commitment to establishing the data infrastructure necessary to enable data sharing and secondary data use.

2. SCOPE AND APPLICABILITY. This policy applies to all Environmental Protection Agency (EPA) organizations and personnel of agents (including contractors and grantees) of EPA who design, develop, compile, operate or maintain EPA information collections developed for environmental program support. Certain requirements of this policy apply to existing as well as new data collections.

3. BACKGROUND.

   a. Fulfillment of EPA's mission to protect and improve the environment depends upon improvements in cross-programmatic, multi-media data analyses. A need for available and reliable location identification information is a commonality which all regulatory tracking programs share.

   b. Standard location identification data will provide a return yet unrealized on EPA's sizable investment in environmental data collection by improving the utility of these data for a variety of value-added secondary applications often unanticipated by the original data collectors.

   c. EPA is committed to implementing its locational policy in accordance with the requirements specified by the Federal Interagency Coordinating Committee for Digital Cartography (FICCDC). The FICCDC has identified the collection of latitude/longitude as the most preferred coordinate system for identifying location. Latitude and longitude are coordinate representations that show locations on the surface of the earth using the earth's equator and the prime meridian (Greenwich, England) as the respective latitude and longitude origins.

d. The State/EPA Data Management Program is a successful multi-year initiative linking State environmental regulatory agencies and EPA in cooperative action. The Program's goals include improvements in data quality and data integration based on location identification.

e. Readily available, reliable and consistent location identification data are critical to support the Agencywide development of environmental risk management strategies, methodologies and assessments.

f. OIRM is committed to working with EPA Programs, Regions and Laboratories to apply spatially related tools (e.g., geographic information systems (GIS), remote sensing, automated mapping) and to ensure these tools are supported by adequate and accurate location identification data. Effective use of spatial tools depends on the appropriate collection and use of location identifiers, and on the accompanying data and attributes to be analyzed.

g. OIRM's commitment to effective use of spatial data is also reflected in the Agency's comprehensive GIS Program and OIRM's coordination of the Agency's National Mapping Requirement Program (NMRP) to identify and provide for EPA's current and future spatial data requirements.

4. <u>AUTHORITIES</u>.

a. 15 CFR, Part 6 Subtitle A, Standardization of Data Elements and Representations

b. Geological Survey Circular 878-B, A U.S. Geological Survey Data Standard, Specifications for Representation of Geographic Point Locations for Information Interchange

c. Federal Interagency Coordinating Committee on Digital Cartography (FICCDC)/U.S. Office of Management and Budget, Digital Cartographic Data Standards: An Interim Proposed Standard

d. EPA Regulations 40 CFR 30.503 and 40 CFR 31.45, Quality Assurance Practices under EPA's General Grant Regulations

5. POLICY.

a. It is EPA policy that latitude/longitude ("lat/long") coordinates be collected and documented with environmental and related data. This is in addition to, and not precluding, other critical location identification data that may be needed to satisfy individual program or project needs, such as depth, street address, elevation or altitude.

b. This policy serves as a framework for collecting and documenting location identification data. It includes a goal that a 25 meter level of accuracy be achieved; managers of individual data collection efforts determine the exact levels of precision and accuracy necessary to support their mission within the context of this goal. The use of global positioning systems (GPS) is recommended to obtain lat/longs of the highest possible accuracy.

c. To implement this policy, program data managers must collect and document the following information:

(1) Latitude/longitude coordinates in accordance with Federal Interagency Coordinating Committee for Digital Cartography (FICCDC) recommendations. The coordinates may be present singly or multiple times, to define a point, line, or area, according to the most appropriate data type for the entity being represented.

The format for representing this information is:

+/-DD MM SS.SSSS (latitude)
+/-DDD MM SS.SSSS (longitude)

where:

- Latitude is always presented before longitude
- **DD** represents degrees of latitude; a two-digit decimal number ranging from 00 through 90
- **DDD** represents degrees of longitude; a three-digit decimal number ranging from 000 through 180

- **MM** represents minutes of latitude or longitude; a two-digit decimal number ranging from 00 through 60

- **SS.SSSS** represents seconds of latitude or longitude, with a format allowing possible precision to the ten-thousandths of seconds

- + specifies latitudes north of the equator and longitudes east of the prime meridian

- - specifies latitudes south of the equator and longitudes west of the prime meridian

(2) Specific method used to determine the lat/long coordinates (e.g., remote sensing techniques, map interpolation, cadastral survey)

(3) Textual description of the entity to which the latitude/longitude coordinates refer (e.g., north-east corner of site, entrance to facility, point of discharge, drainage ditch)

(4) Estimate of accuracy in terms of the most precise units of measurement used (e.g., if the coordinates are given to tenths-of-seconds precision, the accuracy estimate should be expressed in terms of the range of tenths-of-seconds within which the true value should fall, such as "+/- 0.5 seconds")

d. Recommended labelling of the above information is as follows:

- "Latitude"
- "Longitude"
- "Method"
- "Description"
- "Accuracy."

e. This policy does not preclude or rescind more stringent regional or program-specific policy and guidance. Such guidance may require, for example, additional elevation measurements to fully characterize the location of environmental observations.

f. Formats, standards, coding conventions or other specifications for the method, description and accuracy information are forthcoming.

6. RESPONSIBILITIES.

a. The Office of Information Resources Management (OIRM) shall:

(1) Be responsible for implementing and supporting this policy

(2) Provide guidance and technical assistance where feasible and appropriate in implementing and improving the requirements of this policy

b. Assistant Administrators, Associate Administrators, Regional Administrators, Laboratory Directors and the General Counsel shall establish procedures within their respective organizations to ensure that information collection and reporting systems under their direction are in compliance with this policy.

While the value of obtaining locational coordinates will vary according to individual program requirements, the method, description and accuracy of the coordinates must always be documented. Such documentation will permit other users to evaluate whether those coordinates can support secondary uses, thus addressing EPA data sharing and integration objectives.

7. WAIVERS. Requests for waivers from specified provisions of the policy may be submitted for review to the Director of the Office of Information Resources Management. Waiver requests must be based clearly on data quality objectives and must be signed by the relevant Senior IRM Official prior to submission to the Director, OIRM.

8. PROCEDURES AND GUIDELINES. The Findings and Recommendations of the Locational Accuracy Task Force supplement this policy. More detailed procedures and guidelines for implementing the policy are issued under separate cover as the Locational Data Policy Implementation Guidelines.

Attachment B

QUALITY ASSURANCE GUIDANCE INFORMATION

The Agency Quality Assurance (QA)Program is based in EPA Order 5360.1 "Policy and Program Requirements to Implement the QA Program" April 17, 1984. This order and quidance documents for preparing QA Project Plans and QA Programs plans have been the principal agency quidance documents for some years. An extensive EPA effort is now underway to update, codify and expand QA quidance including replacement of the Order with an Order and manual containing the new requirements and quidance documents.

The key new EPA QA documents for State use are:

EPA QA/R-2 — EPA Requirements for quality Management Plans

QA/R-2 is the policy document containing the requirements for Quality Management. QA/R-2 is the replacement for QAMS-004/80 and the subsequent internal EPA quidance on QA Programs Plans issued in 1987.

EPA QA/R-5 — EPA Requirements for Quality Assurance Project Plans.

QA/R-5 is the replacement for QAMS-005/80. This policy document establishes the requirements for QA Project Plans prepared for activities conducted by or funded by EPA.

EPA QA/G-4 — Guidance for the Data Quality Objectives Process

QA/G-4 provides non-mandatory quidance to help organizations plan, implement, and evaluate the Data Quality Objectives (DQO) process, with a focus on environmental decision-making for regulatory and enforcement decisions. This quidance assists in the preparation of the DQO section of EPA QA/R-2 and QA/R-5.

ATTACHMENT C

APPLICABLE REGULATIONS

Grant Administration

A. 40 CFR Part 130.11 stipulates the program management aspects of these grant programs and the contents of the State work programs.

Monitoring

A. 40 CFR Part 130.4 requires that States must establish appropriate monitoring methods and procedures necessary to compile and analyze data on the quality of waters of the United States.

B. 40 CFR Part 35.260 limits funding (if any) under Section 106 of the Clean Water Act if a State which fails to monitor, compile, and analyze data, and report water quality as described under Section 106(e)(1).

Reporting

A. 40 CFR Part 35.360(b) does not allow funding under Section 205(j)(1) to a State agency that fails to report annually on the nature, extent and causes of water quality problems in various areas of the State and Interstate region.

B. 40 CFR Part 130.8(d) specifies that in the years that the section 305(b) is not required, States may satisfy the annual Section 205(j) report requirement by certifying that the most recently submitted section 305(b) report is current or by supplying an update of the sections of the most recently submitted section 305(b) report which require updating.

Planning

A. 40 CFR Part 130.6 identifies the need for continuing water quality planning and defines the content of the water quality management plans. Continuing water quality planning shall be based upon the water quality management plans and the problems identified in the latest section 305(b) report. State water quality plans should focus annually on priority issues and geographic areas and on development of water quality controls leading to implementation measures.

Quality Assurance

A. 40 CFR Part 31.45 states that the grantee shall develop and implement quality assurance practices consisting of policies, procedures, specifications, standards, and documentation sufficient to produce data of quality to adequately meet project objectives and to minimize loss of data due to out-of-control conditions or malfunctions.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 26 1993

OFFICE OF WATER

MEMORANDUM

SUBJECT: Guidance for 1994 Section 303(d) Lists

FROM: Geoffrey H. Grubbs, Director
Assessment and Watershed Protection Division

TO: Water Management Division Directors
Regional TMDL Coordinators
Regions I - X

This memo discusses minimum requirements for the April, 1994, State lists of waterbodies requiring TMDLs under section 303(d) of the Clean Water Act (CWA). This memorandum provides guidance only and builds on previous guidance and reflects the policies and requirements of section 303(d) and the Water Quality Planning and Management regulation at 40 CFR Part 130. This guidance does not establish or affect legal rights or obligations. Decisions in any particular case will be made by applying the CWA and implementing regulations. This guidance is intended to help States and Regions meet the overriding program goals outlined below. It also addresses specific issues that arose during development of the 1992 lists.

The 1992 listing process was very successful. States and Regions used existing data in a very compressed time frame to develop lists of waterbodies requiring TMDLs. States and Regions worked jointly to assure that all requirements, especially those related to public participation, were complied with properly. Based on these lists, States started establishing TMDLs targeted for development during the 1992-1994 biennium.

Development of 1994 section 303(d) lists should build on this success. The section 303(d) list provides a comprehensive inventory of waterbodies impaired by all sources, including point sources, nonpoint sources, or a combination of both. This inventory is the basis for targeting waterbodies for watershed-based solutions, and the TMDL process provides the analytical framework to develop these solutions. Indeed, the use of TMDLs and the TMDL process is becoming an increasingly vital part of a growing number of State programs. The development of TMDLs and the process used to arrive at a TMDL is the technical backbone of the Watershed Protection Approach. Similarly, as larger numbers of permits are written that incorporate water quality-based effluent limits, the position of TMDLs as a keystone in the point source control program is strengthened. Finally, the applicability of the TMDL process to other than chemical stressors, such as degraded habitat and the resulting loss of healthy, balanced ecosystems, is increasingly being realized.

The 1992 listing process was the beginning of a much wider role for TMDLs and the 1994 listing process will continue to improve our ability to integrate solutions to water quality problems on a watershed basis. The three overriding national TMDL program goals for 1994 are:

1. *Develop fully approvable section 303(d) waterbody lists;*

2. *Integrate the section 303(d) listing process more completely into other State program activities, especially as it relates to the Watershed Protection Approach and the targeting of high priority watersheds; and*

3. *Assure consistent application of national §303(d) requirements, especially with regard to public involvement in the 303(d) list development process.*

These goals are discussed below.

1. DEVELOP FULLY APPROVABLE SECTION 303(d) LISTS

Development of fully approvable section 303(d) lists involves a number of considerations including: a) section 303(d) list development requirements; b) availability of data used to develop section 303(d) lists; c) relationship of section 303(d) lists to other CWA assessment and listing requirements; d) unassessed waterbodies; e) timing and content of section 303(d) submissions; and f) EPA review and approval of section 303(d) lists.

Question 1a. ***What are the requirements for including waterbodies on the section 303(d) list?***

Section 303(d) requires that States develop a list of waterbodies that need additional work beyond existing controls to achieve or maintain water quality standards. The additional work necessary includes the establishment of TMDLs. The TMDL process provides an analytical framework to identify the relative contributions of each source to the impairment. The TMDL identifies the sources and causes of pollution or stress, e.g., point sources, nonpoint sources, or a combination of both, and establishes allocations for each source of pollution or stress as needed to attain water quality standards.

Waterbodies that do not or are not expected to meet water quality standards after implementing Best Practicable Technology (BPT), Best Available Technology (BAT), secondary treatment, and New Source Performance Standards (NSPS), as described in sections 301 and 306 of the CWA and defined under EPA regulations are water quality-limited. Not all water quality-limited waterbodies, however, must be included on the section 303(d) list. The Water Quality Planning and Management regulation (40 CFR Part 130) provides that waters need not be included on a section 303(d) list if other Federal, State, or local requirements have or are expected to result in the attainment or maintenance of applicable water quality standards.

Regions may choose to advise States to keep waterbodies on the section 303(d) list, not withstanding establishment of an approvable TMDL, until water quality standards have been met. This approach would keep waterbodies on the section 303(d) list for which TMDLs have been approved but not yet implemented, or approved and implemented, but for which water quality standards have not yet been attained. Some Regions, on the other hand, may choose to advise their States to remove waterbodies from the section 303(d) list once a TMDL has been approved and track and manage TMDL activities and the attainment of water quality standards through other program functions. Under this approach, however, the waterbody should be returned to the section 303(d) list at any time that the approved TMDL and associated controls are found to be inadequate to lead to attainment of water quality standards, or if the controls fail due to incomplete implementation. EPA supports the use of either approach to manage State TMDL activities.

EPA believes that the following general strategy is useful for development of section 303(d) lists.

1. Identify water quality-limited waterbodies, i.e., waterbodies that will not or are not expected to meet water quality standards after the application of technology-based controls required by CWA sections 301(b) and 306.

2. Review water quality-limited waterbodies and eliminate waterbodies from consideration for listing under section 303(d) for which enforceable Federal, State, or local requirements will result in the attainment of applicable water quality standards.

3. Remaining waterbodies constitute the list submitted pursuant to section 303(d).

Several issues arose during the development of 1992 section 303(d) lists that require clarification. A number of States initially failed to list any waterbodies impaired by nonpoint sources. Some States incorrectly asserted that since best management practices (BMPs) or Coastal Zone Act Reauthorization Amendments (CZARA) management measures had not yet been established or implemented, a determination of whether or not the waterbody was water quality-limited could not be made, and waterbodies were omitted from the section 303(d) list.

Lists established under section 303(d) must include all waters for which existing pollution controls or requirements are inadequate to provide for attainment and maintenance of water quality standards. Accordingly, an impaired waterbody cannot be excluded from the section 303(d) list on the basis that required controls have not yet been established. However, if BMPs or CZARA management measures have been established or implemented and water quality standards have been attained or are expected to be attained in the near future, then the waterbody need not be included on the section 303(d) list.

Similarly, a question arose concerning the exclusion of impaired waterbodies from the section 303(d) list where TMDLs have not been completed but enforceable activities are reasonably expected to result in the attainment of applicable water quality standards in the near future. If compliance with water quality standards is to be attained through new effluent limits in permits for point source discharges, it can be assumed that water quality standards will be attained in the near future through established permitting mechanisms. Closer scrutiny is justified, however, where needed load reductions are to be attained through additional nonpoint source controls. In such cases, for the purposes of the 1994 listing process, "the near future" should normally be viewed as prior to the required date for submission of the 1996 section 303(d) list. This should provide adequate time to complete any planning and implementation of nonpoint source control actions. Thus, if planned nonpoint source controls are not expected to lead to attainment of water quality standards by 1996, the water quality-limited waterbody should be included on the 1994 section 303(d) list.

Therefore, the implementation of an enforceable control does provide a rationale for not including a water quality-limited waterbody on the section 303(d) list if the required control is: (1) enforceable, (2) specific to the pollution/stressor problems, and (3) stringent enough to lead to attainment of water quality standards. Further, if the required control has not yet been implemented, a schedule for timely implementation of the control should be provided by the State. The difference, of course, is that the waterbody is not included on the list of waterbodies requiring TMDLs because an alternative method of achieving water quality standards exists.

Finally, a related question arose with respect to threatened waters. The TMDL guidance clearly states that the identification of threatened waters is an important part of the TMDL process and that threatened waters may be placed on the 303(d) list. Threatened waters are those waters that fully support their designated uses but that may not fully support uses in the future (unless pollution control action is taken) because of anticipated sources or adverse pollution trends. Threatened waters may also include high quality waters (e.g., Outstanding National Resource Waters) that may be potentially degraded by unregulated sources or stressors. By placing threatened waters on the section 303(d) list, States will: (1) be consistent with 40 CFR Part 130.7(c)(1)(ii) which requires th TMDLs be established for all pollutants that prevent or are expected to prevent water quality standards from being achieved; (2) be better able to maintain and protect existing water quality; and (3) meet EPA objectives to support State collection of data on impacted and threatened waters.

Question 1b(i). ***What data are needed to include a waterbody on the section 303(d) list?***

In developing the 1992 submissions States used existing readily available data and information and best professional judgement to determine which waterbodies should be included on the section 303(d) list. This general approach should be followed in 1994. States are expected to use a combination of the most reliable databases, best professional judgement, and the best available information to develop section 303(d) lists. In addition, in 1994 greater use of predictive water quality modeling results should be made. EPA expects that this mix of databases, evidence, and best professional judgement will vary from State to State.

There are a number of sources that can be used to help determine whether a particular waterbody belongs on the section 303(d) list. These include section 305(b) reports, Waterbody System information, toxics chemical release inventory (TRI) data, CWA section 314 and 319 assessments, USGS streamflow information, STORET data, fish consumption advisory information, anecdotal information and public reports, and other State and Federal databases. States should use the best available information in making section 303(d) list determinations.

Question 1b(ii). ***What type of information should be considered in deciding whether to include a specific waterbody on the section 303(d) list?***

Determining how much data and information are adequate to include a waterbody on the section 303(d) list is a deliberative process involving judgement. Appendix C of the 1991 TMDL guidance provides a list of screening categories that States should use to identify water quality-limited waters. Examples of the type of data and information that should be used in making this determination are provided below.

- Evidence of a numeric criterion violation. Example: Ambient monitoring data demonstrates exceedance of the State's ammonia criteria.

- Beneficial use impairment. Listing a waterbody due to beneficial use impairment requires information that shows the use is not being maintained and that this failure is due to degraded water quality. Example: A waterbody designated as a cold water fishery has exhibited a documented decline in fish population. The population decline is tied to the existence of sediment deposits on the stream bottom which inhibit or preclude spawning.

- Evidence of a narrative criterion violation. Example: Biological assessment demonstrates that a loss of biological integrity has occurred, in violation of a State's biological criterion.

- Technical analyses. Example: Predictive modeling or Rapid Bioassessment Protocol results that show that criteria will be violated or beneficial uses will not be maintained.

- Impairment demonstrated through other CWA mechanisms. Example: If a waterbody is included on a section 314 or 319 assessment, or is determined to be impaired under section 305(b), it should be reviewed for possible inclusion on the section 303(d) list.

- Other information sources. Other sources that support listing based on best professional judgement include information from the public participation process and information regarding the efficacy of existing control requirements to be implemented in the near future.

Question 1(b)(iii). ***Are biological data that indicate impairments sufficient to support listing a water under section 303(d)?***

As noted above, biological data can be used to support listing a waterbody on the section 303(d) list. This is consistent with the use of biological assessment in EPA's section 305(b) guidelines.

Biological assessments can provide compelling evidence of water quality impairment because they directly measure the aquatic community's response to pollutants or stressors. Biological assessments and biological criteria address the cumulative impacts of all stressors, especially habitat degradation, loss of biological diversity, and nonpoint source pollution. Biological information can help provide an ecologically based assessment of the status of a waterbody and as such can be used to decide which waterbodies need TMDLs.

Question 1c. ***What is the relationship between section 303(d) listed waterbodies and other C'VA assessment activities?***

There are other CWA requirements that require assessments and analyses similar to section 303(d). The most prominent of these are the section 305(b) Report and section 319 assessments.

Section 303(d) lists approved in 1994 should be consistent with these otl..r lists and assessments as compiled and submitted by the States, particularly with regard to the section 305(b) Report because it will generally be submitted at the same time as the section 303(d) list. States and Regions should review potential section 303(d) waterbodies in light of the information contained in these other lists and assessments. To the extent the lists are different, the administrative record for an EPA approval should provide a justificatioı for the differences.

Question 1d. ***Wha' about unassessed waterbodies?***

Waterbodies for which there are no physical, chemical, or biological information available should not be included on section 303(d) lists. However, EPA encourages States to increase the number of waterbodies actually assessed. EPA also expects that as waterbodies are identified for which there are insufficient data or data of questionable validity to determine whether the waterbody should be included on the 303(d) list, States will, to the maximum extent possible, make plans to collect additional information so that better and more informed 303(d) determinations can be made.

Question 1e(i). ***When are 303(d) lists due to EPA?***

States must submit the next section 303(d) list (including pollutant or stressor identification, priority ranking and identification of waterbodies targeted for TMDL development during the next two years) on April 1, 19^4, and every two years after that. Lists may be submitted in conjur :tion with section 305(b) reports.

In order to allow for a thorough review of State 303(d) lists, it is very importanı tnat a dr :ft list be received by EPA prior to submission of a final list. EPA can then transmit comments on the draft section 303(d) list to the State, and revisions can be incorporated prior to providing for public comment. Following completion of public participation requirements, the list should be submitted to EPA as the final 303(d) list.

Question 1e(ii). ***What kind of documentation is required to support a State list submission?***

States should submit adequate documentation to support the listing of waterbodies. Documentation should include a general description of the methodologies used ιo develop the list, a description of the data and information used to identify water quality-limited waters, and a rationale for any decision not to use any one of the categories of information sources listed in

Appendix C of the 1991 TMDL guidance. EPA expects that the 1994 listing methodologies will build upon the methods used to develop the 1992 lists.

EPA may request that the State provide additional information before an approval/disapproval decision is made. Two ways that States may prepare for requests for the information used to list waterbodies may include: (1) keeping an ongoing file or factsheet on each listed waterbody; or (2) waiting for a request for additional information, then assembling the information necessary to respond. While the second option may involve less work in the short term, it is likely that a file of information for a waterbody will be useful and necessary when TMDL development begins.

Question 1e(iii). ***What other information would EPA like to receive?***

In addition to the 303(d) list, EPA is requesting that with each 303(d) list submission, States also include a brief description of the status of TMDL activities on waters that were targeted for development in previous two-year cycles. For example, with the 1994 303(d) list submissions, EPA should receive status reports on the TMDL activities taking place on the waters that were targeted for TMDL development during the 1992-1994 biennium. Similarly, in 1996 EPA should receive updates on the TMDL activities taking place on the waters that were targeted for TMDL development during the 1992-1994 and the 1994-1996 biennium.

Question 1f(i). ***What kind of action can EPA take on a 303(d) list?***

States should work with EPA early in the development of section 303(d) lists to achieve complete, fully approvable list submissions by April 1 of even numbered years. EPA can take four actions on a State's section 303(d) list: (1) approval; (2) disapproval; (3) conditional approval; or (4) partial approval/partial disapproval.

Approval. If EPA determines that a State list (including pollutant or stressor identification, priority ranking, and identification of waterbodies targeted for TMDL development during the next two years) meet all section 303(d) requirements, EPA will notify the State of its approval in writing.

Disapproval. If EPA determines that a State list (including pollutant or stressor identification, priority ranking, and identification of waterbodies targeted for TMDL development during the next two years) substantially fails to meet the requirements of section 303(d) and 40 CFR Part 130, EPA will disapprove the State submission. Following a disapproval, EPA will identify waters where TMDLs are required, pollutants or stressors causing the impairment, and establish priorities and identify waters targeted for State TMDL initiation during the next two years. EPA will complete a proposed list including these elements, and take public comment on its proposed list.

Conditional approval. If EPA determines that a State list is predominantly acceptable, but disagrees with minor elements (e.g., pollutants or stressors causing an impairment), EPA may conditionally approve the list. Conditional approval should be used only for minor deficiencies in State submissions and should not be used to provide general review comments.

When a list has been conditionally approved, EPA will provide the rationale and any available supporting technical information used to justify the suggested revisions, deletions, or additions to the State list and allow the State a specified time period (typically 30 days unless a longer time period is necessary to allow public comment regarding the requested changes) to meet the conditions that EPA outlines. EPA will review the State response and determine whether the specified conditions are satisfied within 30 days of the State response.

Partial approval/partial disapproval. If EPA determines that parts of a State list are approvable and other parts of a State list must be disapproved, EPA may either disapprove the entire list or partially approve/partially disapprove it. In the event of a partial approval/partial disapproval, EPA must then revise the disapproved portion of the list and propose it for public comment as a supplement to the partially approved State list.

Whatever action EPA takes on a State list, EPA should explain the technical, programmatic, and administrative reasons for the action.

Question 1f(ii). ***Can waterbodies be taken off the 303(d) list prior to TMDL development?***

Because section 303(d) lists are dynamic, they may change from one two-year listing cycle to the next. A State may choose to remove a waterbody from its section 303(d) list if that waterbody is meeting all applicable water quality standards (including numeric and narrative criteria and designated uses) or is expected to meet these standards in a reasonable timeframe as the result of implementation of required pollutant controls. It may also be appropriate to remove a waterbody from the section 303(d) list if, upon re-examination, the original basis for listing is determined to be inaccurate. Removal of waterbodies from section 303(d) lists can be done once every two years, or as the waterbodies attain water quality standards during the biennium.

2. INTEGRATE THE SECTION 303(d) LISTING PROCESS MORE COMPLETELY INTO OTHER STATE PROGRAM ACTIVITIES, ESPECIALLY AS IT RELATES TO THE WATERSHED PROTECTION APPROACH AND THE TARGETING OF HIGH PRIORITY WATERSHEDS

Question 2a. ***How does the TMDL process fit in with other CWA water quality program activities?***

The TMDL process is linked to all current State water quality activities. The TMDL process is the technical backbone of the Watershed Protection Approach (WPA), a comprehensive, integrated strategy for more effectively restoring and protecting aquatic ecosystems and protecting human health in geographically targeted watersheds. The TMDL process allows water resource managers and scientists to determine, on a watershed scale, the pollutants or stressors causing impairments and the allocations necessary to meet applicable water quality standards. In addition, the TMDL process provides a mechanism for States to target and prioritize watersheds where action is needed. Further, if a State adopts a rotating basin planning approach to implement its water quality programs, then TMDLs become an integral component of the basin schedule.

The development of section 303(d) lists and the establishment of TMDLs are facilitated by the collection of accurate chemical, physical, and biological data. Therefore, the TMDL process is closely linked to State water quality monitoring programs. Most states currently use the waters listed in the section 305(b) reports as not fully supporting designated uses as a starting point for the section 303(d) lists.

TMDLs can provide a critical connection between water quality standards and water quality-based controls, including National Pollutant Discharge Elimination System (NPDES) permits in the standards to permits process, and BMPs to control nonpoint sources. TMDLs are established based on the goal of attaining water quality standards, including designated uses, numeric and narrative criteria, and antidegradation provisions. Where TMDLs are established, NPDES permits are based on the TMDL and associated wasteload allocations, and nonpoint source controls are implemented consistent with the TMDL and associated load allocations. As a result, permits scheduled for reissuance and State nonpoint source control programs under CWA section 319 provide important information for consideration when developing 303(d) lists and the subsequent TMDLs.

Question 2b. ***What is the relationship between the TMDL process and the requirements of the Endangered Species Act (ESA)?***

Section 7 of the ESA provides broad, general guidance to Federal agencies on how to interact with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) in consultations to determine whether a proposed federal action will affect endangered or threatened species or designated critical habitat. An "action" as defined by the ESA includes all activities or programs that are *authorized, funded, or carried out*, in whole or in part, by Federal agencies.

Whether or not TMDLs, or steps in the TMDL process, are actions as designated under the ESA is a question that is as yet unanswered. An interagency task force including EPA, USFWS, and NMFS is currently developing consultation guidance related to the Clean Water Act. The task force has suggested that the entire process from developing water quality standards to the issuance of a NPDES permit may potentially be viewed as one action. If this is the case, TMDLs may or may not require ESA consultation.

In general, the TMDL process should work to uphold the purpose and intent of the ESA. Consequently, in developing 303(d) lists, States should try to ascertain whether or not threatened or endangered species inhabit waterbodies, whether waterbodies have been designated as critical habitat, and whether proposed TMDLs are sufficient to meet water quality standards designed to protect threatened or endangered species. EPA will continue to monitor the interagency task force's progress in determining what portions of water quality programs may be subject to ESA consultation requirements.

3. ASSURE EVEN AND CONSISTENT APPLICATION OF NATIONAL SECTION 303(d) REQUIREMENTS, ESPECIALLY WITH REGARD TO PUBLIC INVOLVEMENT IN THE 303(d) LIST DEVELOPMENT PROCESS

Question 3a. ***How can States and EPA assure consistent application of the national TMDL program?***

To assure consistency throughout the country in the TMDL process, States and EPA must follow EPA regulations and should follow national TMDL guidance, including the guidance outlined in this memorandum. Any questions about guidance should be directed to EPA. In addition, States and EPA should communicate with each other as frequently as possible about issues related to the TMDL process, including administrative, programmatic, and technical issues. Finally, States and EPA should strive to be creative in finding solutions to TMDL related issues and problems (e.g., trading).

Question 3b. ***How can States and Regions assure consistency in 303(d) lists and prioritization and targeting for waters that flow through more than one State?***

EPA has encouraged States to develop and use their own methods to set priorities and target waterbodies for TMDL development. Waterbodies may therefore be proposed for inclusion on the section 303(d) list that flow through multiple States. Consequently, in some cases, inconsistent listings may be proposed. Regions should be aware of such potential inconsistencies and discuss with the States the possibility of coordinating priority setting and TMDL development efforts. Regions should, if necessary, address any inconsistencies that occur within their jurisdictions among States' section 303(d) lists. Regions are also expected to be aware of, account for, and if necessary, address any inconsistencies between a State of theirs and the State of an adjacent Region.

EPA believes that existing coordination mechanisms are adequate to deal with most potential inconsistencies, and that at this time, it is impractical and unnecessary to institute a formal "cross-checking" procedure to minimize Region-to-Region inconsistencies. However, informal Regional communications, especially between geographically adjacent and geographically similar Regions, should occur on a regular basis to help alleviate, or account for, inconsistencies. EPA Headquarters will help expedite such communication is several ways: (1) by scheduling and facilitating conferences calls among Regions, and (2) by examining the section 303(d) lists submissions to identify any gross inconsistencies.

Question 3c. ***How does public participation fit into the TMDL process?***

There was some confusion in 1992 on requirements for States to provide for public participation in developing §303(d) lists and several Regions had to make section 303(d) list approval/disapproval decisions conditional on State fulfillment of public participation requirements. However, for the 1994 submittal and review process, EPA expects that all public participation requirements will be fulfilled prior to submitting the final section 303(d) list to EPA for formal review.

Public participation for section 303(d) lists must be consistent with section 101(e) of the CWA, which requires EPA and States to provide public participation "in the development, revision, and enforcement of any regulation, standard, effluent limitation, plan, or program established...under the Act." EPA regulations require States to provide public participation in the development of lists of impaired waters under section 303(d). Public participation requirements are outlined in 40 CFR Part 25. In addition, Section 303(d)(2) (40 CFR 130.7(a)) provides that the process for developing section 303(d) lists and public participation be described in the State Continuing Planning Process under section 303(e).

Public participation is that part of the decision making process through which responsible officials become aware of public attitudes by providing ample opportunity for interested and affected parties to communicate their views. Public participation includes providing access to the decision making process, seeking input from and communicating with the public, assimilating public viewpoints, and preferences, and demonstrating that those viewpoints and preferences have been considered by the decision making official.

In the identification of water quality-limited waterbodies for State section 303(d) lists, States need to involve the public as part of their review of all existing and readily available data and information. EPA also expects States to include public participation in its determination of high priority targeted waterbodies that will proceed with TMDL development within two years following the listing process. At a minimum, public participation in the TMDL process should entail notifying the availability of proposed lists in a State Register or equivalent or a State-wide newspaper with a comment period of not less than 30 days. Public meetings should be held at the discretion of each State. It may be expedient to combine public notice for section 303(d) actions with public notices for other water program activities.

Appendix F

Examples of Detailed Descriptions of State Assessment Methods

Illinois Assessment Methodology from Illinois' 1994 305(b) Report

project. In the future, data collected by these volunteers will be used for the educational purposes of school age groups as well as adult volunteer organizations and to assist the IEPA in updating stream use assessments for the Illinois Water Quality Report. For the current 305(b) reporting cycle, IEPA reviewed water chemistry data from rivers and streams collected by high schools throughout the state to assist in use support determinations.

B. ASSESSMENT METHODOLOGY

Traditionally, designated use support assessments for rivers and streams in Illinois have focused on attainment of aquatic life use. In this report for the 1992 reporting cycle, multiple uses based on current water quality standards have been assessed (See Tables 4 and 5). These standards protect various uses including aquatic life, fish consumption, swimming, drinking water supply and secondary contact where applicable. Specific criteria for determining attainment of these individual uses are described in detail below. Minor revisions to the assessment methodology for aquatic life use attainment have been incorporated in accordance with the Federal guidance (U.S. EPA, 1991). These assessments, however, are comparable to those in previous reporting cycles. An overall use support summary for rivers and streams is also provided. The degree of use support attainment is described as: Full, Full/ Threatened, Partial/Minor impairment, Partial/Moderate impairment, and Nonsupport.

Aquatic Life

Aquatic life use assessments were based on a combination of biotic and abiotic data generated from IEPA monitoring programs (See Section A). Biotic data consist of fishery and macroinvertebrate information which were evaluated using the Index of Biotic Integrity (IBI) and the IEPA Macroinvertebrate Biotic Index (MBI), respectively. Types of abiotic data utilized in Aquatic Life Use attainment assessments included water chemistry, fish tissue analysis, sediment chemistry and physical habitat. Stream habitat included metrics such as depth, velocity, substrate and instream cover. Habitat data were used to estimate biotic potential in the form of a Predicted Index of Biotic Integrity value (PIBI) generated from a multiple regression equation. Water chemistry data were evaluated by categories identified as conventionals (dissolved oxygen, pH, temperature) and toxicants (priority pollutants, chlorine, ammonia). Fish tissue and sediment chemistry were based largely on the presence of heavy metals and/or organochlorine compounds.

A few waterbodies were assessed for aquatic life use based only on abiotic data (water or sediment chemistry). In the case of water chemistry only data, a toxicity based criteria for acute and chronic water quality standards were applied (Table 6). For waterbodies where only sediment chemistry data were available, aquatic life use assessments were made utilizing general criteria provided in Table 7. Where appropriate, documented impairments, such as habitat degradation, were also factored into these assessments.

A summary of abiotic and Aquatic Life Use Assessment Criteria, as well as general descriptors of water quality conditions are depicted in Table 8. Also included in Table

TABLE 6. CRITERIA FOR WATER CHEMISTRY USED FOR ASSESSING AQUATIC LIFE USE IN RIVERS AND STREAMS.

Degree of Aquatic Life Use Support	Criteria
Full	0 or 1 violation per parameter of acute standard within 5 year period or no more than 10% of the total individual samples may exceed chronic standard.
Partial/Minor	2 violations per parameter of acute standard within 5 year period or > 10% to 18% of the total individual samples may exceed chronic standard.
Partial/Moderate	2 violations per parameter of acute standard within 3 consecutive year period or 18% to 25% of the total individual samples may exceed chronic standard.
Nonsupport	3 or more violations per parameter of acute standards within 5 year period or > 25% of the total individual samples exceed the chronic standard.

TABLE 7. CRITERIA FOR SEDIMENT CHEMISTRY USED FOR ASSESSING AQUATIC LIFE USE IN ILLINOIS RIVERS AND STREAMS.

Degree of Aquatic Life Use Support	Sediment Chemistry
Full	Metals and organochlorine compounds generally found at nonelevated levels, although some metal or organochlorine compounds may be present at slightly elevated concentrations.
Partial/Minor	Organochlorine compounds or metals occur in stream sediments at elevated levels.
Partial/Moderate	Organochlorine compounds or metals present in stream sediment at highly elevated levels.
Nonsupport	Organochlorine compounds or metals consistently found at extreme concentrations.

TABLE 8. SUMMARY OF USE SUPPORT ASSESSMENT CRITERIA FOR ILLINOIS STREAMS.

U.S. EPA	FULL SUPPORT		PARTIAL SUPPORT MINOR	PARTIAL SUPPORT MODERATE	NON-SUPPORT
GENERAL DESCRIPTION	Good	Good	Fair	Fair	Poor
IEPA/IDOC BIOLOGICAL Stream Characterization (BSC)	Unique Aquatic Resource	Highly Valued Resource	Moderate Aquatic Resource	Limited Aquatic Resource	Restricted Aquatic Resource
FISH/Index of Biotic Integrity (IBI/AIBI)	51-60	41-50	31-40	21-30	< 20
BENTHOS/Macroinvertebrate Biotic Index (MBI)	< 5.0	5.0-5.9	6.0-7.5	7.6-8.9	> 8.9
STREAM Potential Index of HABITAT/Biotic Integrity (PIBI)	51-60	41-50	31-40	< 31	
STREAM IEPA Stream Sediment SEDIMENT/Classification	Nonelevated	Nonelevated -Slightly Elevated	Slightly Elevated	Elevated -Highly Elevated	Extreme

8 are descriptors for Illinois' stream classification process or Biological Stream Characterization (BSC). The overall assessment process for Aquatic Life Use attainment is presented in Figure 3. Field observations were selectively factored into the aquatic life use assessment process through a review of comments and observations of pollution sources and causes of impairment recorded on stream survey field forms. When available, volunteer stream monitoring data was reviewed and incorporated into the assessment process. Professional judgement and knowledge of the study area were required for assessments where various index values appeared to be based upon unrepresentative samples or when conflicts in data needed to be resolved.

"Threatened waters" refers to those waters that fully support their designated use but may not fully support uses in the future (unless pollution control action taken) because of anticipated sources or adverse pollution trends (U.S. EPA 1993). For the 1992-1993 Illinois Water Quality Report the threatened determination was made with the use of available chemical, physical, and biological date and/or information on land use activities. Stream reaches previously assigned full aquatic life use ratings were considered to be threatened when:

- compared to previous monitoring data, current chemical, biological, or physical indicators for exceptional waters exhibited a slight decline in stream quality;
- compared to previous monitoring data, current chemical, biological, or physical indicators exhibited a notable reduction in stream quality, which if continued, might result in a decline of the rating from full to partial support or lower; or
- current activities in the watershed or adjacent to the stream reach might result in impairments and a reduction of the full use designation.

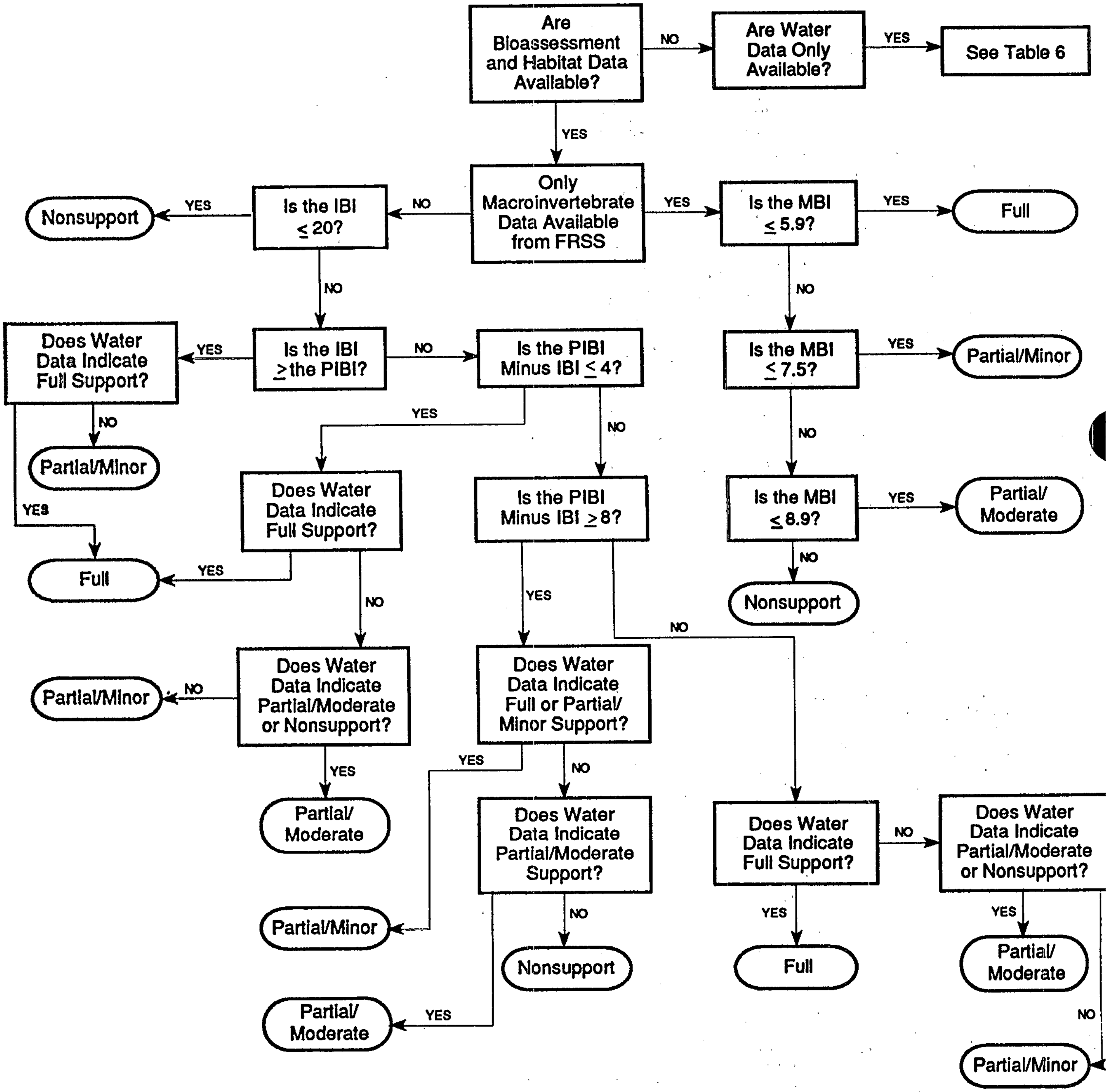
Fish Consumption

The assessment of fish consumption use was based on fish tissue data and resulting sport fish advisories generated by the Fish Contaminant Monitoring Program (See Public Health Chapter). The degree of use attainment for fish consumption was assessed utilizing the criteria depicted in Table 9. All rivers and streams in Illinois, including secondary contact waters, are considered to be attainable for fish consumption use.

Swimming

The assessment of swimming use for primary contact recreation was based on fecal coliform bacteria and water chemistry data from the AWQMN (See Section A). The current Illinois Pollution Control Board (IPCB) bacterial water quality standard specifies that fecal coliform levels below 200/100 ml of water, sampled during the months of May through October should be adequate to protect the State's water for general use and primary contact. Seasonal fecal coliform data and water chemistry data for a period of the last five years from AWQMN stations were analyzed. Geometric means for fecal coliform results were calculated using only those samples collected during warm weather months when recreation in or on the water is likely. Fecal coliform geometric means and individual sample values were compared to the criteria in Table 10. Individual sample values were considered in violation of the standard only if the corresponding total suspended solids value was less than or equal to the fiftieth percentile total suspended solids value for that

Figure 3. Aquatic Life Use Support Assessment Flow Chart for Fish, Habitat and Water Quality Data



station. These criteria provide only an indication of whether or not swimming use attainment can be expected. IT SHOULD BE NOTED THAT THESE CRITERIA ARE ONLY USED AS INDICATORS. TO ASCERTAIN SPECIFIC PUBLIC HEALTH IMPLICATIONS, MORE FREQUENT BACTERIOLOGICAL DATA WOULD BE REQUIRED. Stream miles assessed for swimming included those reaches represented by AWQMN stations. Rivers and streams not considered to be attainable included those designated as secondary contact and indigenous aquatic life use (See Figure 2) as well as those where disinfection exemptions have been approved.

Drinking Water Supply

Drinking Water Supply use assessments for rivers and streams were determined on the basis of water supply closures or advisories obtained from the IEPA's Public Water Supply programs. Rivers and streams utilized as primary source for drinking water supplies were identified. Assessments were based solely on water quality conditions and not on physical closures or relocations due to flooding. The degree of use attainment utilized the criteria identified in Table 11.

Secondary Contact

The assessment of secondary contact use was based on water chemistry data generated from IEPA's monitoring programs (See Section A), primarily the AWQMN. Secondary contact use is the most limited designated use with Illinois State Standards and applies only to certain streams and canals in the Chicago area (Figure 2). These few waters are not, therefore, required to attain primary contact recreational uses such as swimming. All available water chemistry data for the last five-year time period was compared to Secondary Contact Standards (Table 4). Determination of the degree of uses support was based on the assessment criteria in Table 12.

TABLE 9. CRITERIA FOR ASSESSING FISH CONSUMPTION USE IN ILLINOIS RIVERS AND STREAMS.

Degree of Use Support	Criteria
Full	No fish advisories or bans are in effect.
Partial/Moderate	"Restricted Consumption" fish advisory or ban in effect for general population <u>or</u> a subpopulation that could be at potentially greater risk (e.g. pregnant women, children). Restricted consumption is defined as limits on the number of meals or size of meals consumed per unit time for one or more fish species. In Illinois, this is equivalent to a Group II advisory.
Nonsupport	"No consumption" fish advisory or ban in effect for general population for one or more fish species; commercial fishing ban in effect. In Illinois, this is equivalent to a Group III advisory.

TABLE 10. CRITERIA FOR ASSESSING SWIMMING USE IN ILLINOIS RIVERS AND STREAMS.

Degree of Use Support	Criteria
Full	Geometric mean of samples comply with standard or standard exceeded in ≤ 10% of samples.
Partial/Minor	Geometric mean and > 10% but ≤ 18% of samples exceed standard.
Partial/Moderate	Geometric mean and > 18% but ≤ 25% of samples exceed standard.
Nonsupport	Geometric mean and > 25% of samples exceed standard.

TABLE 11. CRITERIA FOR ASSESSING DRINKING WATER SUPPLY USE IN ILLINOIS RIVERS AND STREAMS.

Degree of Use Support	Criteria
Full	No drinking water supply closures or advisories in effect during reporting period; no treatment necessary beyond "reasonable levels".
Partial/Minor	One or more drinking water supply advisory lasting 30 days or less; or problems not requiring closures or advisories but adversely affecting treatment costs and the quality of polished water, such as taste and odor problems, color, excessive turbidity, high dissolved solids, pollutants requiring activated charcoal filters, etc.
Partial/Moderate	One or more drinking water supply advisories lasting more than 30 days per year.
Nonsupport	One or more drinking water supply closures per year.

TABLE 12. CRITERIA FOR ASSESSING SECONDARY CONTACT USE IN ILLINOIS RIVERS AND STREAMS.

Degree of Use Support	Criteria
Full	≤ 10% violations in secondary contact standards.
Partial/Minor	> 10% - 18% violations in secondary contact standards.
Partial/Moderate	> 18% - 25% violations in secondary contact standards.
Nonsupport	> 25% violations in secondary contact standards.

Overall Use

The overall use support of rivers and streams was also assessed. In reviewing the individual use assessments, aquatic life use was considered the best single indicator of overall stream conditions. The overall use support was reported at two assessment levels; monitored and evaluated.

Evaluated waters were those waterbodies for which the overall use support decision was based on information other than current site-specific monitoring data. The assessment basis included a combination of land use information and location of sources, monitoring data more than five-years old, volunteer data, and/or best professional judgement.

Monitored waters were those waterbodies for which the overall use support decision was principally based on current site-specific monitoring data believed to accurately portray water quality conditions. Waterbodies with chemical, physical or biological monitoring data were used to make monitored assessments. Monitored assessments were completed for each site sampled in conjunction with IEPA monitoring (See Section A) conducted in the past five years (1989-1993); however, in certain instances, intensive survey data prior to 1988 was considered representative and used in the assessment process.

C. STATEWIDE WATER QUALITY SUMMARY

For purposes of this report required by Section 305(b) of the Federal Clean Water Act, the estimated number of navigable river and stream miles in and bordering Illinois include a total of 32,190 miles (31,280 interior river miles; 910 border river miles). Data results from over 1,500 river and stream monitoring stations were used in the statewide assessment of overall and individual use supports. These stations are part of ongoing monitoring programs which include the Ambient Water Quality Monitoring Network (AWQMN), Intensive River Basin Surveys, Facility-Related Stream Surveys, and Special Surveys (see Section A).

Overall Use Support

A total of 14,159 of the 32,190 stream miles (44.0%) in Illinois were assessed for the degree of overall use support (Table 13). Statewide assessments were based on both evaluated (4,855.2 stream miles or 34.3%) and monitored (9,303.7 stream miles or 65.7%) levels of assessment. Since overall use support assessments were based on aquatic life use, the results are discussed collectively. Overall use (aquatic life use) was rated as full support on 6,650.3 stream miles (47.0%); 251.7 stream miles (1.8%) were rated as threatened. Partial support with minor impairments of overall use were present on 5,847.9 stream miles (41.3%) and 1,232.4 stream miles (8.7%) were rated as partial support with moderate impairments. Statewide, only 176.6 stream miles (1.2%) were rated as not supporting overall uses.

TABLE 13. STATEWIDE SUMMARY OF DEGREE OF OVERALL USE SUPPORT FOR ILLINOIS RIVERS AND STREAMS.

Degree of Overall Use Support	Assessment Category Evaluated Miles	Monitored Miles	Total Assessed
Full	2,551.6	4,098.7	**6,650.3**
Full/Threatened	53.8	197.9	**251.7**
Partial/Minor	1,801.3	4,046.6	**5,847.9**
Partial/Moderate	396.7	835.7	**1,232.4**
Nonsupport	51.8	124.8	**176.6**
TOTAL	4,855.2	9,303.7	**14,158.9**

Individual Use Supports

The fish consumption use was assessed on 2,832.5 stream miles (Table 14). Full use support was present on 2,325.6 stream miles (82.1%). The remaining 506.9 stream miles (17.9%) were rated as not supporting fish consumption. These nonsupport segments were limited to portions of the Des Plaines, Illinois, Sangamon and Mississippi Rivers (see Public Health Chapter). Of the 2,907.1 stream miles assessed for swimming, 787.9 (27.1%) were rated as full use support (Table 14). Partial support with minor impairment of the swimming use occurred on 91.5 stream miles (3.2%) and 462.2 stream miles (15.9%) were rated as partial support with moderate impairment. The remaining 1,565.5 stream miles (46.2%) were not supporting the swimming use. The swimming use was not applicable to 2,354.8 stream miles. This included secondary contact waters and streams where disinfection exemptions were present. The secondary contact use was applicable to 91.6 stream miles in the Des Plaines River basin. Of these, 24.0 stream miles were rated as full use support. No data was available to assess the remaining 67.6 stream miles. The drinking water use (PWS) was assessed on 822.5 stream miles. Of these, 603.3 stream miles (73.4%) were rated as full use support. Partial support with minor impairment was present on 150.8 stream miles (18.3%) and 68.4 stream miles (8.3%) were rated as partial support with moderate impairment. There were no stream miles rated as not supporting the drinking water use (Table 14).

Causes of Less Than Full Support of Designated Uses

Stream miles impacted by specific cause categories statewide are summarized in Table 15. Stream segments were generally impacted by multiple causes. A comparison of individual cause categories weighted by miles of impairment is shown in Figure 4. The primary cause categories which resulted in less than full

Ohio Assessment Methodology from Ohio's 1994 305(b) Report

Methodology For Assessing Use Attainment

This section describes the procedures used by the Ohio EPA to assess the attainment/non-attainment of aquatic life use criteria. The Ohio EPA monitors and assesses surface water resources in Ohio using an "ecosystem" approach. This includes the use of an array of "tools" including water chemistry physical and habitat assessment, and the direct sampling of the resident biota. In addition, direct threats to human health including fish tissue contamination, bacteriological threats, and drinking water contaminants are also monitored. Aquatic life use attainment status is categorized into the following classes: (1) FULL attainment of use, (2) FULL attainment of use, but attainment is threatened, (3) PARTIAL attainment of use, and (4) NON-attainment of use (Ohio EPA 1987b).

"The Ohio EPA monitors and assesses surface water resources in Ohio using an "ecosystem" approach."

Ohio Water Quality Standards (WQS)

Ohio EPA has employed the concept of tiered aquatic life uses in the Ohio Water Quality Standards (WQS) since 1978. Aquatic life uses in Ohio include the Warmwater Habitat (WWH), Exceptional Warmwater Habitat (EWH), Cold- water Habitat (CWH), Seasonal Salmonid Habitat (SSH), Modified Warmwater Habitat (three subcategories: channel-modified, MWH-C; mine afected, MWH-A; and impounded, MWH-I), Limited Resource Water (LRW), and the now defunct Limited Warmwater Habitat (LWH) designations. Each of these use designations are defined in the Ohio WQS (OAC 3745-1). Table 2-1 lists the size of waterbodies for each aquatic life and non-aquatic life use assigned to Ohio surface waters. The lengths (miles) of designated uses by stream and river size category are illustrated in Figure 2-1.

Water quality standards constitute the numerical and narrative criteria that, when achieved, will presumably protect a given designated use. Chemical-specific criteria serve as the "targets" for wasteload allocations conducted under the TMDL (Total Maximum Daily Load) process. This is used to determine water quality-based effluent limits for point source discharges and, theoretically, load allocations for nonpoint source BMPs (Best Management Practices). Whole effluent toxicity limits consist of acute and chronic endpoints (based on laboratory toxicity tests) and are based on a dilution method similar to that used to calculate chemical-specific limits. The biological criteria are used to directly determine aquatic life use attainment status for the EWH, WWH, and MWH use designations as is stated under the definition of each in the Ohio WQS. The aquatic life uses are briefly described as follows:

EWH **(Exceptional Warmwater Habitat)** - This is the most protective use assigned to warmwater streams in Ohio. Chemical-specific criteria for dissolved oxygen and ammonia are more stringent than for WWH, but are the same for all other parameters. Ohio's biological criteria for EWH applies uniformly statewide and is set at the 75th percentile index values of all reference sites combined. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][c]).

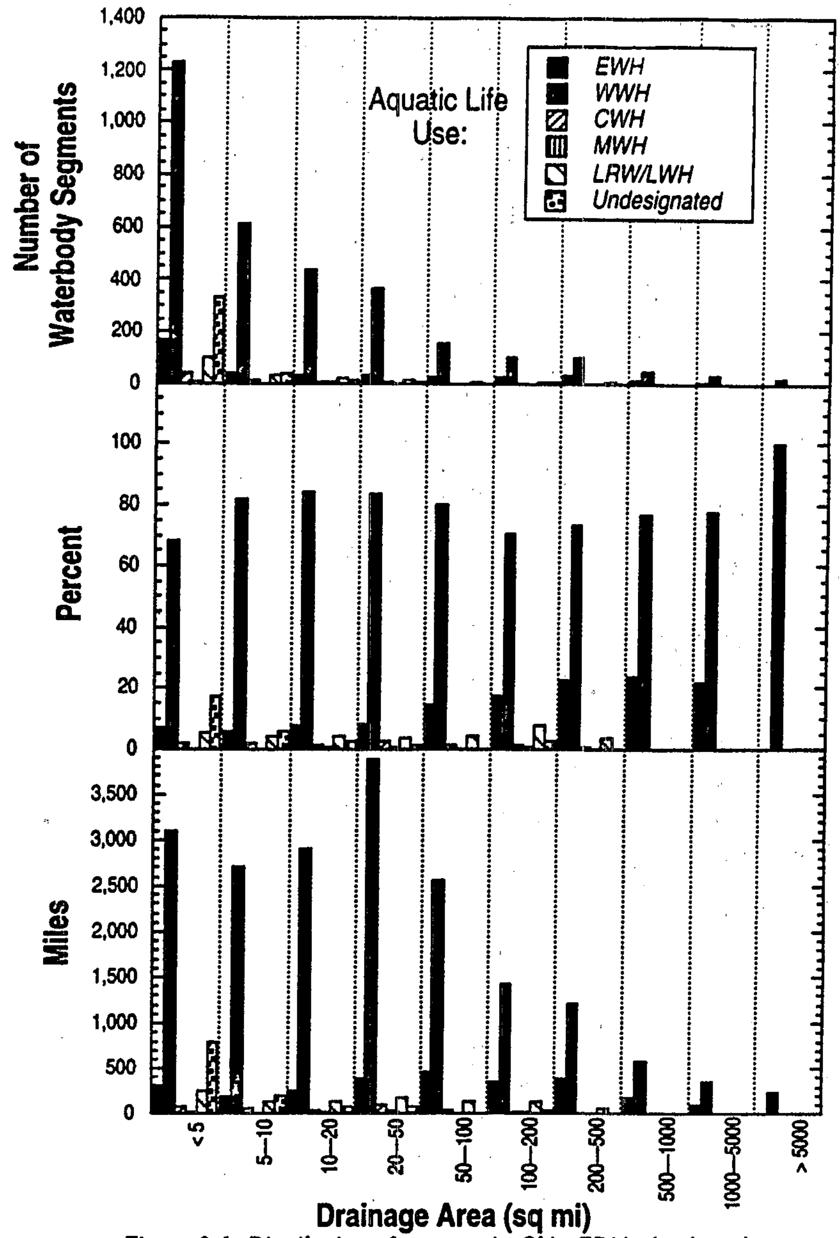


Figure 2-1. Distribution of streams in Ohio EPA's database by aquatic life use and stream size category. Panel A: number of streams; Panel B: % of streams in a drainage size category; Panel C: miles by drainage area category.

WWH (Warmwater Habitat) - WWH is the most widely applied use designation assigned to warmwater streams in Ohio. The biological criteria vary by ecoregion and site type for fish and are set at the 25th percentile index values of the applicable reference sites in each ecoregion. A modified procedure was used in the extensively modified HELP ecoregion. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][a]).

MWH (Modified Warmwater Habitat) - This use was first adopted in 1990 is assigned to streams that have had *extensive* and irretrievable physical habitat modifications. The MWH use does not meet the Clean Water Act goals and therefore requires a Use Attainability Analysis. There are three subcategories: MWH-A, non-acidic mine runoff affected habitats; MWH-C, channel modified habitats; and MWH-I, extensively impounded habitats. The chemical-specific criteria for dissolved oxygen and ammonia are less stringent (and the HELP criteria are less stringent than other ecoregions) than WWH, but criteria for other parameters are the same. Biological criteria were derived from a separate set of modified reference sites. The biocriteria were set separately for each of three categories of habitat impact. The MWH-C and MWH-I subcategory biocriteria were also derived separately for the HELP ecoregion. The MWH-A applies only within the WAP ecoregion. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][d]).

LRW (Limited Resource Waters) - This use is restricted to streams that cannot attain even the MWH use due to extremely limited habitat conditions resulting from natural factors or those of anthropogenic origin. Most streams assigned to this use have drainage areas <3 sq. mi. and are either ephemeral, have extremely limited habitat (with no realistic chance for rehabilitation), or have severe and irretrievable acid mine impacts. Chemical-specific criteria are intended to protect against acutely toxic or nuisance conditions. There are no formal biological criteria. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][g]) and was formerly known as the Nuisance Prevention use designation, which is being phased out of the WQS.

LWH (Limited Warmwater Habitat) - This use was adopted in 1978 to act as a temporary "variance" mechanism for individual segments that had point source discharges which were not capable of meeting the 1977 Clean Water Act mandates. The process of phasing this use designation out of the WQS has been underway since 1985. Chemical-specific criteria were varied for selected parameters, otherwise the criteria for the remaining parameters were the same as for the WWH use. In 1985 all of the LWH segments were placed in a "reserved" status pending a Use Attainability Analysis for each segment. To date 90 of the LWH segments have been revised to either WWH or LRW.

SSH (Seasonal Salmonid Habitat) - This use designation was introduced in 1985 and is assigned to habitats that are capable of supporting the passage of Salmonids between October and May. Another use designation applies during the remaining months. Several tributaries to Lake Erie are so designated. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][e]).

CWH (Coldwater Habitat) - This use includes streams that are capable of supporting cold water aquatic organisms and/or put-and-take Salmonid fishing. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][f]).

In addition to the previously described aquatic life use designations the State Resource Water (SRW) classification is also assigned on a stream and/or segment specific basis. The attributes necessary to assign the SRW classification are described in the Ohio WQS (OAC 374—1-05, Anti-degradation Policy). SRW classifications have also been revised as a by-product of the biosurvey efforts. Since the initial adoption of tiered uses in 1978, the assessment of the appropriateness of existing aquatic life use designations has continued. As of June 1992 there have been a total of 394 changes to segment and stream specific aquatic life uses in six different WQS rule making changes since 1985. The majority of these changes have included the deletion of the State Resource Waters (SRW) classification (116 segments), redesignation of EWH to WWH (95), the designation of previously unlisted streams (84), and the redesignation of the now defunct Limited Warmwater Habitat (LWH) use designation to either WWH or LRW (90). Most of these segments were originally designated for aquatic life uses in the 1978 Ohio WQS. The techniques used then did not include standardized instream biological data or numerical biological criteria. Therefore, because the basin, mainstem, and sub-basin biosurveys subsequently initiated in 1979 represented a "first use" of standardized biological data to evaluate and establish aquatic life use designations, many revisions were made. Certain of the changes may appear to constitute "downgrades" (*i.e.* EWH to WWH, WWH to MWH, etc.) or "upgrades" (*i.e.* LWH to WWH, WWH to EWH, etc.). However, it is inappropriate to consider the changes as such because the 1985 through 1992 revisions constituted the first and continuing use of an objective and robust biological evaluation system and database. The 1978-1992 changes are summarized in Figure 2-2 of the 1992 report (Ohio EPA 1992).

"...the basin, mainstem, and sub-basin biosurveys subsequently initiated in 1979 represented a "first use" of standardized biological data to evaluate and establish aquatic life use designations..."

Ohio EPA is also under obligation by a 1981 public notice to review and evaluate all aquatic life use designations outside of the WWH use, prior to calculating water quality-based effluent limitations for point sources. Thus many of the recommended revisions constitute a fulfillment of that obligation.

There are various estimates of the total miles of streams and rivers in Ohio. The Ohio Department of Natural Resources estimates 43,917 total miles of perennial and intermittent (*i.e.* streams that are either dry during or do not flow part of the year) streams and rivers in Ohio (Ohio DNR 1960). U.S. EPA (1991a) has estimated that Ohio has 61,532 total miles of streams (29,113 perennial; 29,602 intermittent; and 2,818 ditches and canals). This estimate is from a computer-digitized map of U.S. streams and rivers produced by the USGS (1:100,000 scale Digital Line Graph [DLG] method). The U.S. EPA version of this map is known as Reach File 3 (RF3). Ohio EPA has adopted the U.S. EPA estimate of *perennial* stream miles in order to promote consistency between 305(b) reports produced by all states. The origin of the discrepancies between the various estimates of stream and river mileage mentioned above will be more closely examined in future 305(b) reports. However, the most likely sources of the differences between the Ohio DNR and U.S. EPA estimates are the large number of small, minor tributaries that appear on the DLG maps and differing estimates of segment lengths. Not all of the perennial streams in Ohio have been assigned an aquatic life use designation nor have all of the existing uses been confirmed with ambient biosurvey information using the previously discussed procedures.

Table 2-1. Summary of classified aquatic and non-aquatic life uses for Ohio surface waters in the Ohio WQS (OAC 3745-1).

Use Designation	Classified for Use: Streams/Rivers (Miles)	Lakes (Number)	Lakes (Acres)	Lake Erie (Shore Miles)
		Aquatic Life Uses		
Ohio Estimate:				
Total	43,917.0[1]	50,000	200,000[2]	236
Ohio Estimate:				
Perennial(Named)	24,348.7	—	—	—
USEPA Est: Total[3]	61,532.0	5,130	188,461	
USEPA Est: Perennial[3]	29,113.0	—	—	—
Ohio Estimate:				
EWH	2,991.7	—	193,903[4]	236
WWH	18,364.7	—	—	—
CWH	378.4	—	—	—
SSH	103.0	—	—	—
MWH	813.1	—	—	—
LWH	636.8	—	—	—
LRW	527.1	—	—	—
No Use	1271.2	—	—	—
		Water Supply		
PWS	—	447	118,801	—
		Recreation		
PC	22,412.8	50,000[5]	200,000[5]	236
SC	1,044.7	—	—	—
		State Resource Waters		
SRW	3,812	447	118,801	—
		Antidegradation Waters		
SHQW[6]	—	—	—	—

Abbreviations: **WWH** - Warmwater Habitat; **EWH** - Exceptional Warmwater Habitat; **CWH** - Coldwater Habitat; **SSH** - Seasonal Salmonid Habitat; **MWH** - Modified Warmwater Habitat; **LWH** - Limited Warmwater Habitat; **LRW** - Limited Resource Water; **PWS** - Public Water Supply; **BW** - Bathing Waters; **PC** - Primary Contact; **SC** - Secondary Contact; **SRW** - State Resource Waters; **SHQW** - Superior High Quality Waters.

[1]Estimated from ODNR (1960).
[2]Estimated from ODNR (unpublished)
[3]USEPA (1991a) estimate.
[4]All publicly owned lakes and reservoirs except Piedmont Reservoir.
[5]Lakes and Reservoirs and not specifically given a primary contact recreation use in OAC, but this use is assumed.
[6]Superior High Quality Waters are an additional classification recently proposed for antidegradation purposes.

Approximately 1271 miles of small streams (primarily watersheds less than 5 sq. mi. in area) in the Ohio database have not been designated. At present, the true difference between the U.S. EPA estimate of perennial stream miles and Ohio EPA's estimate of named or designated streams is due to the inclusion of undesignated streams in RF3 and discrepancies in estimates stream length. Use designations will continue to be reviewed and updated for named streams and assigned to unnamed streams as each is encountered within the schedule and resources assigned to the 5 Year Basin Approach.

The assessment of aquatic life use support and the assignment of causes and sources of impairment generally followed the guidelines set forth in *Guidelines for the Preparation of the 1994 State Water Quality Assessment (305(b)Report* (U. S. EPA 1993).

"The identification of the impairment status of streams and rivers is straightforward - the Ohio biological criteria are the principal arbiter of aquatic life use attainment/non-attainment."

Table 2-2. U.S. EPA and Ohio DNR estimates of lake acreage by lake size.

Size	Number	Acres
	U.S. EPA Estimate (Total Lakes)	
<10 acres	3,788	17,415
10-500 acres	1,295	46,323
> 500 acres	47	124,723
Total	**5130**	**188,461**
	Ohio DNR Estimate (Publicly Owned)	
<10 acres	108	717
10-500 acres	293	22,321
> 500 acres	46	95,763
Total	**447**	**118,801**

How Stream Segments Were Assessed: "Multiple Lines of Evidence"

A factor essential to an understanding the results of this report, and for comparing these results to other states' reports, is the methodology used for the assessment of "use attainment" and ascribing causes and sources of impairment. Ohio's intensive survey program is not "experimental" in nature although its foundation is based on an extensive and rigorous body of such work in the ecological literature. The identification of the impairment status of streams and rivers is straightforward - the Ohio biological criteria are the principal arbiter of aquatic life use attainment/non-attainment. The rationale for using biological criteria as the principal arbiter within a "weight of evidence" approach to aquatic life use assessment has been extensively discussed elsewhere (Karr *et al.* 1986; Ohio EPA 1987a,b; Yoder 1989; Miner and Borton 1991; Yoder 1991a). Ascribing the causes and sources *associated* with the observed impairment relies on an interpretation of multiple lines of evidence from water chemistry data, sediment data, habitat data, effluent data, biomonitoring results, land use data, and response signatures within the biological data itself. Thus cause and source associations are not based on a true "cause and effect" analysis, but rather are based on associations with stressor and exposure indicators whose links with the biosurvey data are based on previous research or experience with analogous impacts. The reliability of the identification of probable causes and sources increases where many such prior associations have been identified. The process is akin to making a medical diagnosis in which a doctor relies on multiple lines of evidence concerning a patient's health. Such diagnoses are based on previous research which experimentally or statistically linked symptoms and test results to specific diseases or pathologies. Clearly, the doctor does not "experiment" on a patient, but rather relies on previous experience in interpreting the multiple lines of evidence (test results) to generate a diagnosis, potential causes or sources of the malady, a prognosis, and a strategy for alleviating the symptoms of the disease or condition. The ultimate arbiter of success is the eventual recovery and the well-being of the patient. While there have been criticisms of misapplying the metaphor of ecosystem "health" compared to human patient "health" (Suter 1993; e.g., concept of ecosystem as a super-organism) here we are referring to the process for identifying biological integrity and cause/source associations not whether human health and ecosystem health are analogous concepts.

"Direct measures of overall health that integrate all of the factors that could effect ecological integrity are essential for an accurate picture of an ecosystem's condition."

Water chemistry samples are analogous to various diagnostic tests (e.g., a blood sample) that may clearly identify a health problem, but that cannot provide a positive indication of the overall well-being of a patient. A serious water quality standard violation for a toxic parameter, for example, is likely to be a good indicator of impairment; however, the lack of a violation in no way confirms the presence of biological integrity. Direct measures of overall health that integrate all of the factors that could effect ecological integrity are essential for an accurate picture of an ecosystem's condition. The inclusion of biosurvey data, based on biocriteria, into a broad, integrated intensive survey program, is the best way to achieve when the goal is protecting and restoring aquatic life. Our work has shown that the inclusion of biosurvey data in ambient monitoring efforts can boost the detection of aquatic life use impairment by approximately 35-50% over that obtained with a simplified water column chemistry approach alone (*i.e.* measuring exceedences of a suite of routinely monitored chemical parameters; Ohio EPA 1990a). The use attainment/non-attainment criteria for the biological indices are summarized by organism group, biological index, site type (fish), use designation, and ecoregion in Table 2-3 and on Map 2-1. The chemical-specific criteria in the Ohio WQS were used to assess chemically-based use attainment/non-attainment and generally follows U.S. EPA guidelines for assessing aquatic life support (U.S. EPA 1991b) with chemical data alone (Table 2-4).

"...the inclusion of biosurvey data in ambient monitoring efforts can boost the detection of aquatic life use impairment by approximately 35-50% over that obtained with a simplified water column chemistry approach alone..."

Table 2-3. Decision criteria for determining use attainment based on biological data.

Non-Attainment
A.] Neither ICI, IBI, or MIwb meet criteria for ecoregion
OR
B.] One organism group indicates a severe toxic impact (poor or very poor category) even if the other indicates attainment.
Partial Attainment
A.] One of two or two of three indices do not meet ecoregion criteria (and are not in the poor or very poor category)
Full Attainment
A.] All indices meet ecoregion criteria

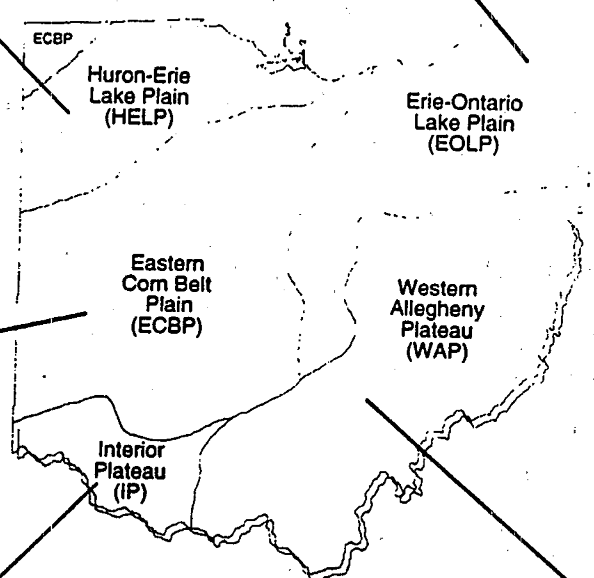
Segments with only water chemistry data that were assessed under previous U.S. EPA 305(b) report guidelines were *not* reassessed for this report. For water quality parameters without aquatic life criteria in the Ohio WQS (mostly nutrients, conventional substances, and naturally occurring metals), ambient results were compared to values from a set of "least impacted" regional reference sites. These "background" expectations were based on work in progress by Dennis Mishne, Ohio EPA, who is examining the ranges of variability of water chemistry and sediment data collected at "least impacted" reference sites by ecoregion (the same group of sites used to develop the biological expectations). This comparison was especially useful for watersheds that are impacted by nonpoint sources such as coal mining activities. The degree of deviation from reference site data provided an alternate screen for parameters generally associated with coal mining, but which lack aquatic

Huron-Erie Lake Plain (HELP)

USE	SIZE	IBI	MIwb	ICI
WWH	H	28	NA	34
	W	32	7.3	34
	B	34	8.6	34
MWH-C	H	20	NA	22
	W	22	5.6	22
	B	20	5.7	22
MWH-I	B	30	5.7	NA

Erie Ontario Lake Plain (EOLP)

USE	SIZE	IBI	MIwb	ICI
WWH	H	40	NA	34
	W	38	7.9	34
	B	40	8.7	34
MWH-C	H	24	NA	22
	W	24	6.2	22
	B	24	5.8	22
MWH-I	B	30	6.6	NA



Eastern Corn Belt Plains (ECBP)

USE	SIZE	IBI	MIwb	ICI
WWH	H	40	NA	36
	W	40	8.3	36
	B	42	8.5	36
MWH-C	H	24	NA	22
	W	24	6.2	22
	B	24	5.8	22
MWH-I	B	30	6.6	NA

Interior Plateau (IP)

USE	SIZE	IBI	MIwb	ICI
WWH	H	40	NA	30
	W	40	8.1	30
	B	38	8.7	30
MWH-C	H	24	NA	22
	W	24	6.2	22
	B	24	5.8	22
MWH-I	B	30	6.6	NA

Western Allegheny Plateau (WAP)

USE	SIZE	IBI	MIwb	ICI
WWH	H	44	NA	36
	W	44	8.4	36
	B	40	8.6	36
MWH-C	H	24	NA	22
	W	24	6.2	22
	B	24	5.8	22
MWH-A	H	24	NA	30
	W	24	5.5	30
	B	24	5.5	30
MWH-I	B	30	6.6	NA

Statewide: Exceptional Criteria

USE	SIZE	IBI	MIwb	ICI
EWH	H	50	NA	46
	W	50	9.4	46
	B	48	9.6	46

Map 2-1. Ohio's Biocriteria. See text for descriptions of aquatic life uses.

life use criteria (e.g. manganese, aluminum). Of the characteristic coal mining influenced parameters only pH was used to assess aquatic life use impairment (in the absence of biological data) because it is the only parameter with a WQS criteria value. The other parameters were used to confirm mining impacts where pH was low and to screen waterbodies for further study. For streams without pH data or without a direct pH impairment, exceedences of the "background" concentrations for two or more of the other parameters was used to indicate moderate or major impacts.

Table 2-4. Categories of deviation from relatively unimpacted reference sites for parameters without aquatic life use water quality criteria.

No Effects
(Within Range of Reference Sites)

1. Mean and 90th % tile < Median of r eference sites
2. Mean and 90th % tile < 75th %tile of r eference sites AND Mean > Median of r eference sites and 90th %tile < Median OR 90th % tile > Median of r eference sites and Mean < Median.
3. Mean and 90th % tile < 75th %tile of r eference sites AND Mean and 90th % tile > Median of reference sites.
4. Mean and 90th % tile < 2* UQ[1] + Median of reference sites AND Mean > 75th %tile of reference sites and 90th %tile < 2* UQ + Median OR 90th % tile > 75th %tile of r eference sites and Mean < 2* UQ + Median.

Minor effects
(Upper Range to Slightly Above Range of Refer ence Sites)

1. Mean and 90th % tile > 75th %tile of r eference sites AND Mean and 90th % tile < 2* UQ + Median of reference sites.
2. Mean and 90th % tile < 5* UQ + Median of r eference sites AND Mean > 2* UQ + Median of reference sites and 90th %tile < 2* UQ + Median OR 90th % tile > 2* UQ + Median of r eference sites and Mean < 2* UQ + Median.

Moderate effects
(Values Significantly Above Range of Refer ence Sites)

1. Mean and 90th % tile > 2* UQ + Median of refer ence sites AND Mean and 90th % tile < 5* UQ + Median of reference sites.
2. Mean and 90th % tile < 10* UQ + Median of refer ence sites AND Mean > 5* UQ + Median of reference sites and 90th %tile < 5* UQ + Median OR 90th % tile > 5* UQ + Median of reference sites and Mean < 5* UQ + Median.

Severe effects

1. Mean and 90th % tile > 5* UQ + Median of r eference sites AND Mean and 90th % tile < 10* UQ + Median of reference sites.
2. Mean and 90th % tile > 10* UQ + Median of r eference sites.

[1]UQ-Upper Quartile (75th per centile)

Table 2-5. Concentrations of ambient chemical parameters used to indicate increasing severity of mine affected waters compared to relatively unimpacted reference sites.

Parameter	Median	75th %tile	75th%tile +Median [UQ]	2*UQ + Med.	5*UQ + Med.	10*UQ + Med.
Field Conduct.	445.0	692.0	247.0	939.0	1680.0	2915.0
Lab Conduct.	481.0	739.0	258.0	997.0	1771.0	3061.0
pH[1]						
Chloride	24.6	43.7	19.1	62.8	120.1	215.6
Sulfate	129.0	242.7	113.7	356.4	697.5	1266.0
Iron	885.0	1495.0	610.0	2105.0	3935.0	6985.0
Manganese	135	300.5	165.5	466.0	962.5	1790.0
TDS	443.0	509.0	66.0	575.0	773.0	1103.0

[1]pH categories based on Ohio WQS and Ohio EPA (1980): No effects: 6.5-9.0; minor effects: 5.5-6.4; moderate effects: 4.5-5.4; severe effects < 4.5.

Table 2-6. Concentrations of fish tissue contaminants considered: (1) not elevated, (2) slightly elevated, (3) moderately elevated, (4) highly elevated, or (5) extremely elevated.

PCBs:

0-50 µg/kg - **not elevated**

51-300 µg/kg - **slightly elevated**

301-1000 µg/kg - **moderately elevated**

1001-1900 µg/kg - **highly elevated**

> 1900 µg/kg - **extremely elevated**

Other Parameters:

> FDA action level - **highly – extremely elevated**

Table 2-7. Classification of the types of monitoring data used to make aquatic life use assessments for the 1992 305(b) report arranged in decreasing order of confidence with regard to data rigor and accuracy.

Description	Assessment Level[1]	Evaluated	Moni-tored
Most Confidence/Highest Accuracy			
Intensive survey with biological & water chemistry data, both fish and macroinvertebrates sampled[2]	700	—	MB
Intensive survey with biological & water chemistry data, only one biotic group (fish or macroinvertebrates) sampled	700	—	MB
Intensive survey with biological data only, fish or macro-invertebrates sampled	300	—	MB
Intensive survey with water chemistry data only	200	—	MC
Intensive survey with water chemistry data only (pre-1988)	200	EC	—
Biological Fixed Stations and intensive biosurveys from before 1986.	300	EB	—
Chemical Fixed Stations (NAWQMN, NASQAN, IJC, etc.) Volunteer Monitoring (with good QA/QC procedures)	200	EC	—
Least Confidence[4]/Lower Accuracy			
Volunteer Monitoring (without QA/QC procedures)	100	ES	—
Survey/Source Data (Complaints, "opinion" surveys, etc.)[3]	100	ES	—

1 More specific codes are provided in Appendix A.

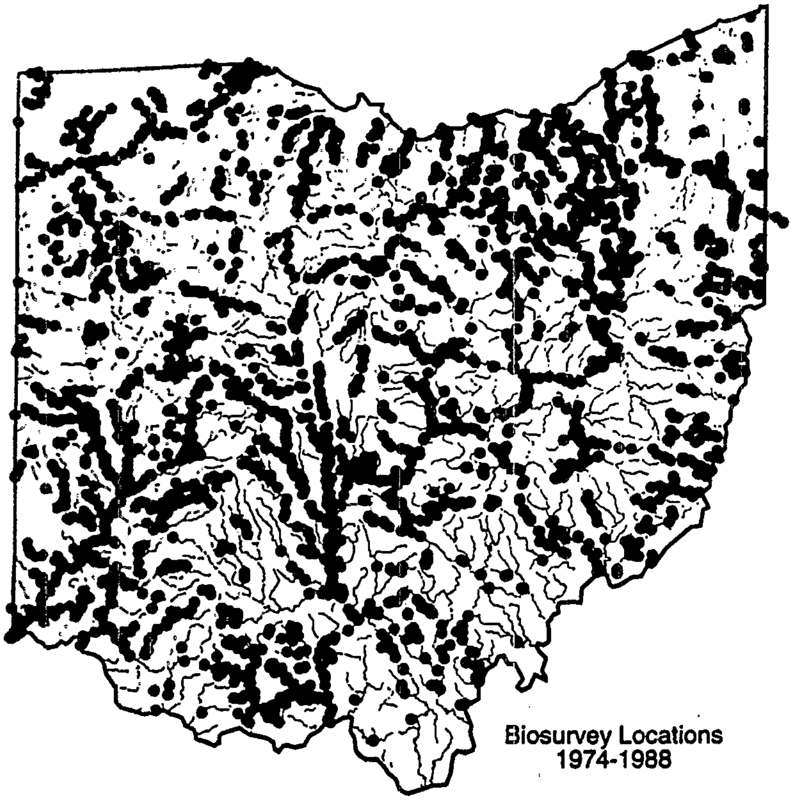
2 For headwater streams (< 20 square miles) streams are assigned a level 700 code where water chemistry and only the fish community were sampled.

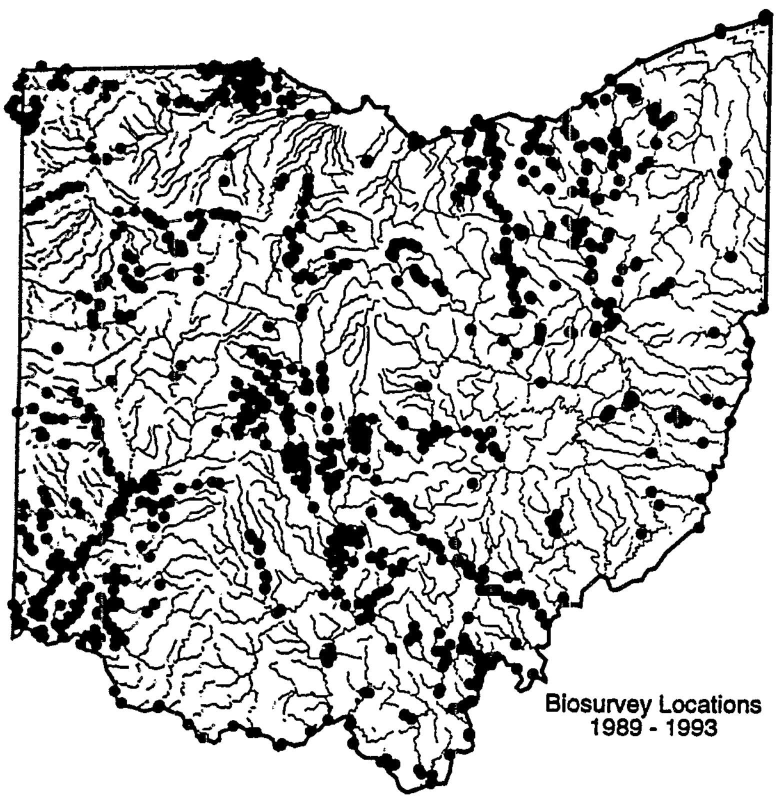
3 Aquatic life use attainment decisions are not made with source level data or data types not listed here. Source level data is used to flag areas for further study or to identify areas that are likely to be *impacted* (see Ohio Nonpoint Source Assessment).

4 This data used to flag sites as possibly impacts but not used to determine aquatic life use impairment.

"The most rigorous data is from an "intensive" survey that includes water chemistry (effluent, water column, sediment), bioassay, physical habitat, and both fish <u>and</u> macro-invertebrate data."

The categories assigned to the monitoring data used in this assessment generally follow U.S. EPA guidelines with some exceptions as outlined in Table 2-7. The classification of data collection methods reflects the rigor of the data used and the resultant accuracy of the aquatic life use assessment. The most rigorous data is from an "intensive" survey that includes water chemistry (effluent, water column, sediment), bioassay, physical habitat, and *both* fish *and* macro-invertebrate data. For waterbodies where only water chemistry data was available, the identification





Map 2-2. Location of Ohio EPA biosurvey sampling stations during the period 1974 - 1988 (top panel) and 1989-1993 (bottom panel).

of chemical criteria exceedences (PARTIAL or NON-attainment), rather than the absence of such exceedences (FULL attainment), was the more reliable and environmentally accurate approach.

"...the confidence in the aquatic life use assessments was further increased when data from both fish and macroinvertebrates was available..."

The comparatively "narrow" focus of water chemistry data provides less confidence about aquatic life use attainment status than the broader-based biological community measures. Similarly, the confidence in the aquatic life use assessments was further increased when data from both fish and macroinvertebrates was available (particularly in complex situations) than when data from only one organism group was available (see Table 2-7). Toxicity testing (acute and/or chronic bioassays) results alone were not used to assess use attainment status nor were volunteer monitoring data, the results of "opinion" surveys, or unsubstantiated or anecdotal information. Such information, however, is quite useful for indicating areas of potential impairment or for suggesting when conditions may be changing.

"In addition to the Ohio Water Resource Inventory, Ohio EPA produces the Ohio Nonpoint Source Assessment (NPSA; Ohio EPA 1990b)..."

The assessments in this report relied primarily on monitored level data. The location of biosurvey sites across Ohio are illustrated in Map 2-2. The top panel illustrates sites sampled up to and including 1988 and the bottom panel sites sampled from 1989 through 1993. Although the intended focus of the Ohio Water Resource Inventory is broad (*i.e.* the same data serves multiple purposes), the impetus for the development of much of the database was driven by point source issues (*i.e.* NPDES permits, construction grants, etc.) and towards larger streams and rivers. For smaller streams there is proportionately less monitored level data to assess impacts such as nonpoint pollution. However, each subbasin or mainstem level survey was designed to assess all relevant sources of impact to water quality, habitat, and the biota. Also, the "extrapolability" of the results in the smaller watersheds is greater than for the larger rivers and streams. This has been especially enhanced by employing the ecoregion concept (Omernik 1987). In addition to the Ohio Water Resource Inventory, Ohio EPA produces the Ohio Nonpoint Source Assessment (NPSA; Ohio EPA 1990b) which is coordinated by the Nonpoint Source Management Section within the Division of Water Quality Planning and Assessment. The Ohio NPSA summarizes the extent and types of nonpoint source pollution in Ohio's surface water and groundwater resources utilizing all levels of available information, thus some of the estimates of the proportion of impaired waters by major source are different between the Ohio NPSA and the 305(b) report. The Ohio NPSA relies heavily on an extensive survey of over 200 local, county, state, and federal agencies in Ohio. Thus the information gained from these questionnaires is considered as "source" level data which is insufficient to assess aquatic life use impairment, but is useful for identifying potential areas of nonpoint source impacts. The Ohio NPSA also incorporates all of the monitored level data reported in the 1990 305(b) report. The results are further used to develop and implement the Ohio Nonpoint Source Management Program (NPSMP; Ohio DNR 1989) which is coordinated by the Ohio Department of Natural Resources, Division of Soil and Water Conservation.

"The Ohio NPSA relies heavily on an extensive survey of over 200 local, county, state, and federal agencies in Ohio."

The Ohio NPSA data is included in the Waterbody System (WBS). For areas of the state covered by intensive biological surveys, the effects of nonpoint sources have been assessed and are reflected in the WBS segment summaries and the discussion of causes and sources of impairment found in this volume. In the cases where survey level information was available in the absence of monitored level information a 'P' (Potential) magnitude code was indicated in the WBS. This level of nonpoint source assessment is limited to use as screen for a potential *impact* to a waterbody. The presence of sources *alone* is insufficient evidence for a direct impairment and can be verified with monitored-level data only. The source level assessments for each WBS segment appear in Appendix B of the 1992 report, and in more detail in the Ohio NPSA (Ohio EPA 1990b).

Highlights from nonpoint source education/ demonstration projects funded by Section 319 grants between 1981 and 1987 are summarized in Ohio EPA (1991). Many of the original state and local contract agencies have applied for Section 319 implementation grants. It is a goal of Ohio EPA to be able to measure the actual environmental effectiveness of these activities by describing the results of monitored level evaluations in future 305(b) reports.

Biological Data Collected by Other State Agencies

The National Academy of Sciences, in a report on the state of surface water monitoring in the U.S (National Academy of Sciences 1977), listed three important deficiencies in monitoring programs. One of these was a lack of coordination between different agencies, boards, and institutions that were involved in surface water monitoring and water quality management. Differing reasons for monitoring is partly responsible for the lack of ease in sharing and utilizing other agencies data. However, other reasons include barriers such as incompatible data base management techniques and a lack of standardization of field methods. An informal working group that includes members from the Ohio EPA, Ohio DNR, Ohio Department of Transportation, and the Ohio State University Museum of Zoology has attempted to resolve some of these issues. The result has been an improved ability to share biological data, even though the objectives for the original data collection may be different from the objectives of those who may later access the same data. For example the intensive monitoring effort by the ODNR-Division of Natural Areas and Preserves in the southern portion of the Scioto River and Southeast Ohio River tributaries basins was to assess the status and distribution of the rosyside dace (*Clinostomus funduloides*) in Ohio. Other geographically concentrated survey efforts are the result of surveys designed to assess the distribution and abundance of other endangered and threatened fish species. In contrast, data collected by the Ohio Department of Transportation is scattered throughout the state because of the primary objective to assess the environmental condition at bridge construction and replacement projects throughout Ohio. Fortunately, the active effort to share biological data between Ohio agencies and institutions has resulted in our ability to include it in this report.

"...the active effort to share biological data between Ohio agencies and institutions has resulted in our ability to include it in this report."

Biological data from other agencies used in this report includes fish community data collected by the Ohio DNR - Division of Natural Areas and Preserves, Ohio DNR - Division of Wildlife, the Ohio Department of Transportation (ODOT), and the Ohio State University Museum of Zoology (OSUMZ).

The use of other agencies and institutions environmental data has long been viewed as an untapped panacea to the problems of a lack of monitoring resources at the state and federal level. While this inherently seems attractive from a cost and efficiency standpoint, there are some important limitations. Each agency usually has different objectives for the monitoring efforts in which data is collected. While the aforementioned agencies have attempted to standardize and emulate the manner in which each collects fish community data, this does not completely eliminate differences in effort, variables reported, etc. A "phased" approach towards incorporating non-Ohio EPA data in the WBS database as either monitored or evaluated level information will be used.

Fortunately, much of the available fish community data is of acceptable quality and the collection methodologies each agency uses are not only documented and well known, but are essentially similar in most respects. However, a key "missing" dimension is in having been at the sampling location to observe the conditions first hand. This is a crucial element in the interpretation of the results, particularly the assignment of causes and sources of impairment.

"...when relying on water chemistry data collected by other agencies (and Ohio EPA), it is used primarily to infer the presence of a problem, not the absence of a problem."

The error tendencies of field biological information need to be understood to accurately incorporate "outside" data into assessments. Water chemistry data (especially grab sampling) is likely to be biased towards "missing" a problem that actually exists, but which is not reflected in the results (Rankin and Yoder 1990). Thus, when relying on water chemistry data collected by other agencies (and Ohio EPA), it is used primarily to infer the presence of a problem,*not* the absence of a problem. In contrast, the error tendencies of biological field data is more likely to result in the indication of an impairment when it does not exist. This is most frequently due to inadequate or differential sampling that results in the failure to secure an adequate or representative sample. In the case with other agencies biological data (as a first phase for 1992 305[b] report) it was used primarily to indicate*attainment* of the applicable aquatic life use.

Table 2-8. Hierarchy of ambient bioassessment approaches that use information about indigenous aquatic biological communities (NOTE: this applies to aquatic life use attainment only - it does not apply to bioaccumulation concerns, wildlife uses, human health, or recreation uses).

BIOASSESSMENT TYPE	SKILL REQUIRED[1]	ORGANISM GROUPS[2]	TECHNICAL COMPONENTS[3]	ECOLOGICAL COMPLEXITY[4]	ENVIRONMENTAL ACCURACY[5]	DISCRIMINATORY "POWER"[6]	POLICY RESTRICTIONS[7]
1."Stream Walk" (Visual Observations)	Non-biologist	None	Handbook[8]	Simple	Low	Low	Many
2.Volunteer Monitoring	Non-biologist to Technician	Invertebrates	Handbook[9], Simple equipment	Low	Low to Moderate	Low	↓
3.Professional Opinion (EPA RBP Protocol V)	Biologist w/ experience	None or Fish/Inverts.	Historical records	Low to Moderate	Low to Moderate	Low	↓
4. EPA RBP Protocola I & II	Biologist w/ training	Invertebrates	Tech. Manual,[10] Simple equip.	Low to Moderate	Low to Moderate	Low to Moderate	↓
5. Narrative Evaluations	Aquatic Biologist w/training & experience	Fish &/or Inverts.	Std. Methods, Detailed taxonomy Specialized equip.	Moderate	Moderate	Moderate	↓
6.Single Dimension Indices	(same)	(same)	(same)	Moderate	Moderate	Moderate	↓
7. EPA RBP Protocols III & V	(same)	(same)	Tech. Manual,[10] Detailed taxonomy, Specialized equip.	High	Moderate to High	Moderate to High	↓
8. Regional Reference Site Approach	(same)	(same)	Same plus baseline calibra ion of multimetric evaluation mechanisms	High	High	High	Few

1 Level of training and experience needed to accurately implement and use the bioassessment type.
2 Organism groups that are directly used and/or sampled.
3 Handbooks, technical manuals, taxonomic keys, and data requirements for each bioassessment type.
4 Refers to ecological dimensions inherent in the basic data that is routinely generated by the bioassessment type.
5 Refers to the ability of the ecological end-points or indicators to differentiate conditions along a gradient of environmental conditions.
6 The relative power of the data and information derived to discriminate between different and increasingly subtle impacts.
7 Refers to the relationship of biosurveys to chemical-specific, toxicological (i.e. bioassays), physical, and other assessments and criteriathat serve as surrogate indicators of aquatic life use attainment/non-attainment.
8 Water Quality Indicators Guide: Surface Waters (U.S. Dept. Agric. 1990)
9 Ohio Scenic River Stream Quality Monitoring (Kopec and Lewis 1983).
10 U.S. EPA Rapid Bioassment Protocol (Plafkin et al. 1989).

IBI values were calculated, but were considered as *minimum* values for use attainment purposes. Data dimensions such as the presence or absence of intolerant and/or tolerant taxa, high species richness, and the relative distribution of individuals among various functional guilds was also examined since these are generally correlated with higher IBI scores that are commensurate with at least WWH use attainment. Other than through gross species misidentifications (unlikely to be a significant problem given the skilled professional staff at the above mentioned agencies) the data are considered accurate and reliable for this level of assessment. Indications of NON-attainment that are reflected in the results will be more thoroughly investigated in future 305(b) reports via consultations with the other agencies. This will further aid in the identification of causes and sources of the *suspected* NON-attainment. It is also an Ohio EPA goal to access historical fish community information (*i.e.* pre-1975-80 data) for the purpose of examining long-term changes in distribution and abundance, and to include other organism groups such as naiad mollusks, amphibians, and possibly birds to broaden the overall environmental assessment.

"It is... an Ohio EPA goal to access historical fish community information... for the purpose of examining long-term changes ..., and to include other organism groups such as naiad mollusks, amphibians, and possibly birds to broaden the overall environmental assessment.

Other Evaluation Approaches and Limitations on Including as Evaluated or Monitored Level Assessments

There are a number of methods and procedures for the evaluation of water resources and biological integrity other than those used by Ohio EPA. These range from simple, visual assessments to more complex and comprehensive bioassessments. The U.S. Department of Agriculture, Soil Conservation Service has developed a guide for the assessment of water quality using a stream walk technique (USDA 1990). Minimum skill and ecological expertise is needed to use this method, hence its attractiveness. Other methods such as "volunteer" monitoring using stream macro-invertebrates (*e.g.* Izaak Walton League "Save Our Streams", Ohio DNR SQM, etc.) are also usable by non-experts with a minimum of training and orientation. U.S. EPA's Rapid Bioassessment Protocols (RBP; Plafkin *et al.* 1989) specify five approaches of increasing complexity and ecological rigor. As with any environmental assessment technique, the more "dimensions" (*i.e.* specific chemical, physical, and biological attributes) of the ecosystem that are measured the more

"Accuracy is defined...as the ability and precision of an assessment to portray and evaluate the true ecosystem condition."

comprehensive the resultant evaluation and hence the greater its accuracy. Accuracy is defined here as the ability and precision of an assessment to portray and evaluate the true ecosystem condition. Although, the cost of obtaining information increases with its inherent complexity and accuracy the cost per return on investment declines.

In addition the impact of the information on multi-million dollar decisions also makes it more cost-effective. We have established a hierarchy of bioassessment types for the purpose of demonstrating the relative capabilities of each of eight different approaches (Table 2-8).

The purpose of this comparison is to illustrate that there are important and sometimes unrealized differences between different levels of bioassess-ment, not only in the cost and relative skill requirements, but also in the quantity, quality, and power of the information provided by each. The latter factors are often given less weight than the cost and skill components and we believe they are equally, if not more important considerations. In addition, there is an unfortunate tendency to equate the information derived from all biosurvey approaches and to "over sell" the capabilities of the simpler techniques.

"...the power and ability of a bioassessment technique ...are directly related to the data dimensions produced by each."

Our analyses reveal that the power and ability of a bioassessment technique to accurately portray biological community performance and ecological integrityand discriminate ever finer levels of aquatic life use impairments are directly related to the data dimensions produced by each. For example, a technique that includes the identification of macroinvertebrate taxa to genus and species will produce a greater number of data dimensions than a technique that is limited to family level taxonomy. Similarly, the accuracy of an approach that employs two organism groups is likely to be more capable of accurately detecting a broad range of impairments than will reliance on a single group. Approaches that rely on multi-metric evaluation mechanisms will yield greater information than a reliance on single dimension indices, and so on. Of the different bioassessment types included in Table 2-8, we have extensively tested volunteer monitoring (see next subsection), narrative evaluations, single-dimension indices, and the regional reference site approaches (Ohio EPA 1990c; Yoder 1991a). The remaining categories were inserted into the hierarchy based on ours and others use and knowledge of each.

"The level of bioassessment should play an important role in the consideration and establishment of policy on the use of biosurvey information relative to its integrated use with chemical-specific and toxicity information..."

This concept is not only crucial to understanding the power and accuracy of biosurvey information, but also with placing limits on its use as a tool to assess and manage surface water resources. The level of bioassessment *should* play an important role in the consideration and establishment of policy on the use of biosurvey information relative to its integrated use with chemical-specific and toxicity information (Yoder 1991a; Table 2-8). Many have referred to the relationship between water chemistry, bioassay, and biosurveys as each being an equal leg of a three-legged stool. However, this analogy is inadequate (Karr 1989) and naively presumes that the relationships will be equal in all regions and all waters across the U.S. Obviously, there will be situations in which one or two of the tools will yield more information than the others, thus the site-specific application of biosurvey information must be done with flexibility and in accordance with the aforementioned constraints. Simply continuing to rigidly equate each tool independently not only has some serious technical flaws, but may serve as a serious disincentive to states in constructing a more rigorous biosurvey approach. In contrast, an important incentive for states to construct a more rigorous and comprehensive biosurvey approach can be provided by permitting biocriteria policy flexibility. The advantage to a state is in increased programmatic flexibility while the return to U.S. EPA is an ecologically more rigorous, more accurate monitoring capability that will produce more comprehensive and reliable monitoring efforts nationwide. Concerns about potential abuses of biosurveys are minimized given the inherent error tendencies of biosurvey information (*i.e.* "favorable" results cannot be produced by poor or under-representative sampling). The improved ability to detect and characterize environmental problems with the more comprehensive approaches will lead to improved protection of our declining lotic resources. Given the present difficulties with the inequities between state monitoring and assessment capabilities this issue should be given serious consideration.

"...an important incentive for states to construct a more rigorous and comprehensive biosurvey approach can be provided by permitting biocriteria policy flexibility."

Volunteer Monitoring

"...environmental agencies need to be aware of the limitations of this approach, both technically and logistically, prior to depending on this as a major source of monitoring information."

U.S. EPA has recently been encouraging the use of ambient data collected by "volunteers" (U.S. EPA 1990a). For lotic systems this includes the qualitative sampling of macroinvertebrates and using a picture key to identify organisms and rate the sample on a scale from poor to excellent. For lakes it usually includes taking turbidity measurements using secchi disks and observational information. The obvious and attractive advantages of this data are that it can generate substantial interest among the public about surface water resources and the attributes of these waters that are being protected by state agencies. It can also provide information at little or no cost to the government. However, environmental agencies need to be aware of the limitations of this approach, both technically and logistically, prior to depending on this as a major source of monitoring information. Data collected by volunteers can be useful to state agencies in waterbodies of special interest (*e.g.* State Scenic Rivers) or in waterbodies where the state is unlikely to conduct monitoring.

In Ohio there are two major Volunteer programs of note. One is the "Stream Quality Monitoring" program coordinated by the Scenic Rivers section of the Ohio DNR, Division of Natural Area and Preserves. The other is the "Citizen Lake Improvement Program" (CLIP). The various groups and government agencies participating in volunteer monitoring efforts in Ohio are listed in Table 2-8. Although volunteer stream monitoring programs can provide useful ancillary information on the status of certain surface waters and information on emerging problems they *are not replacements* for more comprehensive state monitoring efforts. The Ohio EPA, for example, has a Five-year Basin Approach for systematically assessing stream and river basins in Ohio through standardized, integrated, and rigorous ambient monitoring including biosurvey data.

The Ohio DNR, Scenic Rivers volunteer monitoring program conducts annual stream quality assessments that are summarized in an annual report. The data are transferred by diskette to Ohio ECOS, Ohio EPA's biological information database.

Although U.S. EPA encourages the consideration of volunteer data in state monitoring networks and 305(b) reports, the information gained should be limited to the screening of potential problems. This is especially true of the stream macroinvertebrate collection efforts because the methods include skill dependent biological sampling, microhabitat selection and/or availability, and the identification of biological samples. The use of volunteer data is likely to be less restrictive if the efforts are limited to the collection of grab water samples or other comparatively simple measurements such as secchi depth. The Ohio CLIP lakes effort is an example of such a program.

There is little information on the reliability and accuracy of volunteer collected biological data over a broad range of environmental conditions (*i.e.* exceptional to very poor conditions). One recent effort in Ohio (Dilley 1991), compared the results from a volunteer biological sampling methodology (Ohio DNR, Scenic Rivers SQM) with Ohio EPA's biological community data collected at the same sites. This analysis represents a "best case" scenario because the SQM monitoring was performed by a single, trained and skilled investigator (*i.e.* between sampler variability and individual operator errors were eliminated). The results indicated a fairly good correspondence between the SQM results using CIV (Community Index Value) scores and the Ohio IBI and ICI at the extremes of the environmental spectrum. The correspondence was generally good (better for the ICI) between the CIV fair and poor categories and IBI/ICI values that did not attain the WWH criteria, and between the CIV exceptional category and IBI/ICI values that at least attained the WWH criteria. The correspondence was best between the CIV results and ICI where the SQM effort was performed in a riffle. CIV scores in the good range, however, corresponded to a wide range of IBI and ICI scores that both attained and failed to attain the WWH criteria. Furthermore, it was not possible to consistently distinguish between WWH (good) and EWH (exceptional) attainment using the CIV alone. These findings point out an inherent trait of qualitative methodologies in that they produce fewer data dimensions and hence less discriminatory power. While qualitative and narrative approaches have the ability to distinguish conditions at the

"These findings point out an inherent trait of qualitative methodologies in that they produce fewer data dimensions and hence less discriminatory power."

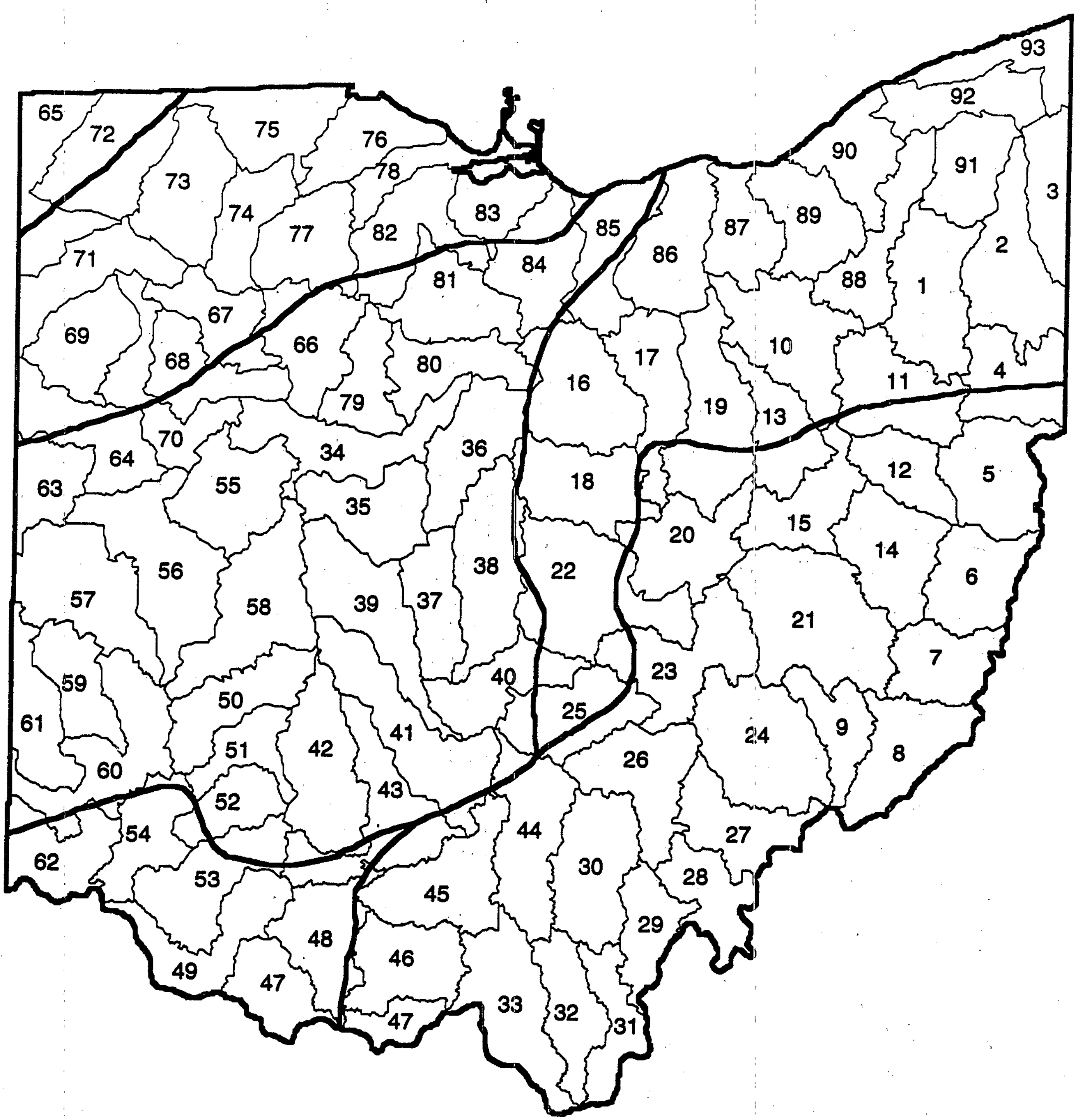
extremes of the environmental spectrum (*i.e.* poor vs. exceptional), each lacks the dimensional power to further distinguish the "in between" situations (Hilsenhoff 1991). This is not dissimilar to the findings of a comparison of qualitative, narrative biocriteria and regional reference site derived numerical biocriteria. In this comparison the narrative approach yielded erroneous results in 21-36% of the comparisons, with the error tendency being clearly towards *underestimating* a problem (Ohio EPA 1990c; Yoder 1991a). This particular analysis only points out the problems in the evaluation of the data, since the data set was generated by the same standardized Ohio EPA methods. Volunteer approaches introduce another significant source of error, sampling efficiency (includes both physical sampling effort and field identification of macro-invertebrate taxa). These types of problems and biases are common to any method and should be accounted for up front. The Dilley (1991) study provided some important insights into the limitations that should be placed on SQM type information. Further analysis of information from multiple field collectors (including less skilled volunteers) should be performed prior to acceptance of this type of data as an *evaluated* level assessment. The primary purposes of the Ohio DNR Stream Quality Monitoring program are; (1) to educate and generate interest in specific scenic rivers, and (2) to develop and maintain a base of information to evaluate long-term changes in stream and river quality. This type of data should easily serve these purposes and provide Ohio EPA with useful indications of potentially emerging problems and whether high quality waters are being threatened.

"...the greatest interest...in using SQM as a monitoring tool has been shown by selected county Soil and Water Conservation Districts..."

To date, the greatest interest (outside of the Ohio DNR Scenic Rivers program) in using SQM as a monitoring tool has been shown by selected county Soil and Water Conservation Districts (SWCD) in implementing and monitoring the progress and results of Section 319 nonpoint source pollution abatement projects. This information is a potential source of useful information when interpreted within the constraints of the methodology. Ohio EPA has agreed to accept this data for inclusion in Ohio ECOS as a screening tool for nonpoint source assessments.

Key to Map 2-4

1 - UPPER MAHONING RIVER
2 - LOWER MAHONING RIVER
3 - PYMATUNING CREEK
4 - LITTLE BEAVER CREEK
5 - CENTRAL TRIBS (YELLOW CREEK AND CROSS CREEK)
6 - CENTRAL TRIBS (SHORT CREEK AND WHEELING CR.)
7 - CENTRAL TRIBS (MCMAHON, CAPTINA, SUNFISH CR.)
8 - LITTLE MUSKINGUM RIVER
9 - DUCK CREEK
10 - UPPER TUSCARAWAS RIVER
11 - NIMISHILLEN CREEK;
12 - CONOTTON CREEK
13 - SUGAR CREEK
14 - STILLWATER CREEK
15 - LOWER TUSCARAWAS RIVER
16 - BLACK FORK, CLEAR FORK, ROCKY FORK MOHICAN R
17 - LAKE FORK, JEROME FORK, MUDDY FORK MOHICAN R
18 - KOKOSING RIVER
19 - KILLBUCK CREEK
20 - UPPER MUSKINGUM RIVER AND WAKATOMIKA CREEK
21 - WILLS CREEK
22 - LICKING RIVER
23 - MIDDLE MUSKINGUM RIVER
24 - LOWER MUSKINGUM RIVER
25 - UPPER HOCKING RIVER
26 - MIDDLE HOCKING RIVER
27 - LOWER HOCKING RIVER
28 - SE TRIBS (SHADE RIVER AND LEADING CREEK)
29 - SE TRIBS (LOWER RACCOON CREEK)
30 - SE TRIBS (UPPER RACCOON CREEK)
31 - SE TRIBS (LITTLE INDIAN GUYAN CREEK)
32 - SE TRIBS (SYMMES CREEK)
33 - SE TRIBS (LITTLE SCIOTO RIVER AND PINE CREEK)
34 - UPPER SCIOTO RIVER (AND LITTLE SCIOTO RIVER)
35 - SCIOTO RIVER (MILL CR.,BOKES CR., FULTON CR.)
36 - UPPER OLENTANGY RIVER
37 - LOWER OLENTANGY RIVER
38 - BIG WALNUT CREEK
39 - BIG DARBY CREEK
40 - WALNUT CREEK;
41 - MIDDLE SCIOTO RIVER (INCLUDING DEER CREEK)
42 UPPER PAINT CREEK
43 - LOWER PAINT CREEK (N. FK. AND ROCKY FK.)
44 - SALT CREEK;
45 - SCIOTO RIVER (SUNFISH CR.,BEAVER CR.)
46 - LOWER SCIOTO RIVER (AND SCIOTO BRUSH CREEK);
47 - SW TRIBS (EAGLE CREEK AND STRAIGHT CREEK)
48 - OHIO BRUSH CREEK
49 - SW TRIBS (WHITEOAK CR.,INDIAN CR., BEAR CR.)
50 - UPPER LITTLE MIAMI RIVER
51 - CAESAR CREEK
52 - TODD FORK
53 - EAST FORK LITTLE MIAMI RIVER
54 - LOWER LITTLE MIAMI RIVER
55 - UPPER GREAT MIAMI RIVER
56 - GREAT MIAMI RIVER AND LORAMIE CREEK
57 - STILLWATER RIVER
58 - MAD RIVER
59 - TWIN CREEK
60 - MIDDLE GREAT MIAMI RIVER
61 - FOURMILE CREEK
62 - LOWER GREAT MIAMI RIVER AND WHITEWATER R.
63 - WABASH RIVER
64 - ST. MARYS RIVER
65 - ST. JOSEPH RIVER
66 - BLANCHARD RIVER
67 - LOWER AUGLAIZE RIVER
68 - OTTAWA RIVER
69 - LITTLE AUGLAIZE RIVER
70 - UPPER AUGLAIZE RIVER;
71 - UPPER MAUMEE R. (INCLUDING GORDON CREEK);
72 - TIFFIN RIVER
73 - UPPER MIDDLE MAUMEE RIVER;
74 - LOWER MIDDLE MAUMEE RIVER
75 - LOWER MAUMEE RIVER (AND OTTAWA RIVER)
76 - LAKE ERIE TRIBS MAUMEE R. TO PORTAGE R.
77 - UPPER PORTAGE RIVER
78 - LOWER PORTAGE RIVER
79 - TYMOCHTEE CREEK
80 - UPPER SANDUSKY RIVER
81 - MIDDLE SANDUSKY RIVER
82 - LOWER SANDUSKY RIVER
83 - LAKE ERIE TRIBS SANDUSKY R. TO VERMILION R
84 - VERMILION RIVER
85 - HURON RIVER;
86 - BLACK RIVER
87 - ROCKY RIVER
88 - UPPER CUYAHOGA RIVER
89 - LOWER CUYAHOGA RIVER
90 - LAKE ERIE TRIBS (CHAGRIN RIVER)
91 - UPPER GRAND RIVER
92 - LOWER GRAND RIVER\
93 - ASHTABULA RIVER AND CONNEAUT CREEK.



Map 2-4 Watersheds used for summarizing use attainment in Ohio.

Key To Map 2-5

01 - Hocking River Basin
- a - Hocking River
- b - Federal Creek
- c - Sunday Creek
- d - Monday Creek
- e - Rush Creek

02 - Scioto River Basin
- a - Scioto River
- b - Scioto Brush Creek
- c - Sunfish Creek
- d - Salt Creek
- e - Saltlick Creek
- f - Middle Fk. Salt Creek
- g - Paint Creek
- h - N. Fk. Paint Creek
- i - Rocky Fk. Paint Creek
- j - Rattlesnake Creek
- k - Deer Creek
- l - Big Darby Creek
- m - Little Darby Creek
- n - Walnut Creek
- o - Big Walnut Creek
- p - Alum Creek
- q - Olentangy River
- r - Whetstone Creek
- s - Mill Creek
- t - Little Scioto River
- u - Rush Creek

03 - Grand River Basin
- a - Grand River

04 - Maumee River Basin
- a - Maumee River
- b - Ottawa River
- c - Ten Mile Creek
- d - Swan Creek
- e - Beaver Creek
- f - Turkeyfoot Creek
- g - Tiffin River
- h - Mud Creek
- i - Powell Creek
- j - Flatrock Creek
- k - Blue Creek
- l - Prairie Creek
- m - Town Creek
- n - Little Auglaize River
- o - Blanchard River
- p - Ottawa River
- q - Auglaize River
- r - St. Mary's River
- s - St Josephs River
- t - W. Br. St. Josephs River
- u - Nettle Creek
- v - Fish Creek

05 - Sandusky River Basin
- a - Sandusky River
- b - Muddy Creek
- c - Wolf Creek
- d - Honey Creek
- e - Tymochtee Creek

06 - Central Tribs Basin
- a - Yellow Creek
- b - Cross Creek
- c - Short Creek
- d - Wheeling Creek
- e - Captina Creek
- f - Sunfish Creek
- g - Little Muskingum River
- h - Duck Creek
- i - E. Fk. Duck Creek

07 - Ashtabula Creek Basin
- a - Ashtabula River
- b - W. Br. Ashtabula River
- c - Conneaut Creek

08 - Little Beaver Creek Basin
- a - Little Beaver Creek
- b - N. Fk. L. Beaver Creek
- c - W. Fk. L. Beaver Creek
- d - M. Fk. L. Beaver Creek

09 - Southeast Tribs
- a - Shade River
- b - Leading Creek
- c - Raccoon Creek
- d - Little Raccoon Creek
- e - Symmes Creek
- f - Pine Creek
- g - Little Scioto River

10 - Southwest Tribs
- a - Ohio Brush Creek
- b - W. Fk. Ohio Brush Creek
- c - Straight Creek
- d - Whiteoak Creek

11 - Little Miami River Basin
- a - Little Miami River
- b - E. Fk. L. Miami River
- c - Todd Fork
- d - Caesar Creek

12 - Huron River Basin
- a - Huron River
- b - West Fork Huron River

13 - Rocky River Basin
- a - Rocky River
- b - W. Fk . Rocky River

14 - Great Miami River Basin
- a - Great Miami River
- b - Whitewater River
- c - Indian Creek
- d - Four Mile Creek
- e - Sevenmile Creek
- f - Twin Creek
- g - Mad River
- h - Buck Creek
- i - Stillwater River
- j - Greenville Creek
- k - Loramie Creek

15 - Chagrin River Basin
- a - Chagrin River

16 - Portage River Basin
- a - Portage River
- b - M. Br. Portage River
- c - S. Br. Portage River

17 - Muskingum River Basin
- a - Muskingum River
- b - Wolf Creek
- c - Meigs Creek
- d - Salt Creek
- e - Moxahala Creek
- f - Jonathan Creek
- g - Licking River
- h - N. Fk. Licking River
- i - Raccoon Creek
- j - S. Fk. Licking River
- k - Wakatomika Creek
- l - Wills Creek
- m - Slat Creek
- n - Leatherwood Creek
- o - Seneca Fork
- p - Tuscarawas River
- q - Stillwater Creek
- r - L. Stillwater Creek
- s - Connotton Creek
- t - Sugar Creek
- u - S. Fk . Sugar Creek
- w - Nimishillen Creek'
- x - Chippewa Creek
- y - Walhonding River
- z - Killbuck Creek
- aa - Kokosing River
- bb - Mohican River
- cc - Clear Fork
- dd - Black Fork
- ee - Lake Fork
- ff - Jerome Fork
- gg - Muddy Fork

18 - Mahoning River Basin
- a - Mahoning River
- b - Mosquito Creek
- c - Eagle Creek
- d - W. Br.Mahoning River
- e - Yankee Creek
- f - Pymatuning Creek

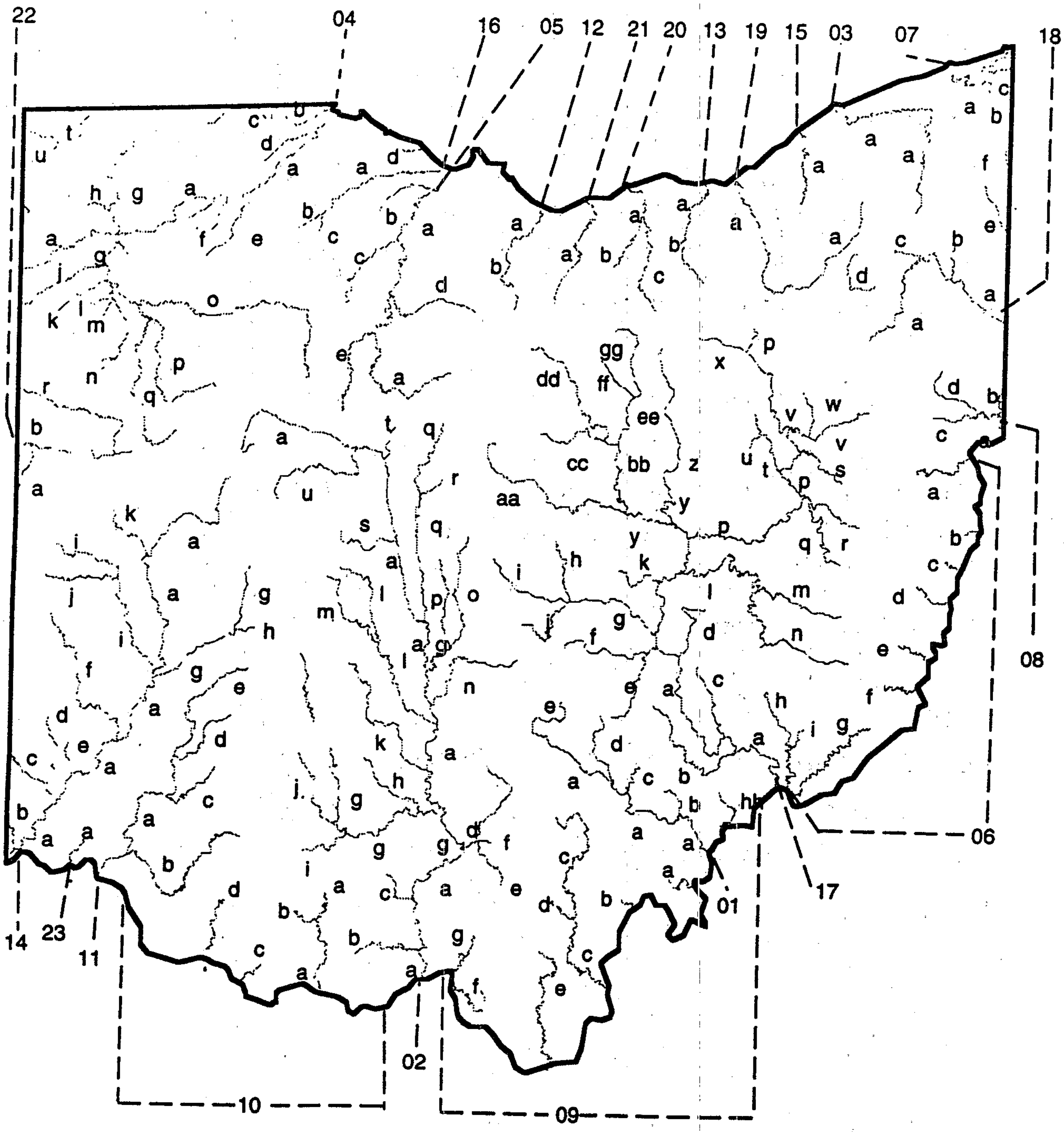
19 - Cuyahoga River Basin
- a - Cuyahoga River

20 - Black River Basin
- a - Black River
- b - W. Br. Black River

21 - Vermilion River Basin
- a - Vermilion River

22 - Wabash River Basin
- a - Wabash River
- b - Beaver Creek

23 - Mill Creek Basin
- a - Mill Creek
- c - E. Br. Black River



Map 2-5. Streams and rivers of Ohio with drainage areas > 100 sq mi.

Sources and Causes of Impairment

Sources and causes of PARTIAL or NON-attainment were assigned by waterbody segment as major (H), moderate (M), slight (S), or unverified potential impact (P) based on an integrated assessment of the available data and the interpretations of the biologists and scientists who actually planned and conducted the field investigations. Only causes and sources of impairment that are *presently* apparent or exist are listed. Potential causes and sources, the effects of which are not currently being exhibited, are listed as a "P" (potential impact). As a surface water recovers with time, some of the potential causes may become evident and will be listed at that time with one of the standard (H, M, or S) codes. Most of Ohio's streams and rivers are affected by multiple sources and causes, and these tend to be "layered" on one another. Thus the reduction or elimination of one impact may reveal the presence of another underlying impact.

"Sources and causes of PARTIAL or NON attainment were assigned ...based on an integrated assessment of the available data and the interpretations of the biologists and scientists who actually planned and conducted the field investigations."

The assignment of causes and sources in the Waterbody System (WBS) is necessarily broad in comparison to the detailed assessments contained in the Technical Support Documents completed by Ohio EPA for each Five-year Basin study area. The delineation of WBS segments frequently does not coincide with "boundaries" of change in the ambient results. As such, the detailed information in these and other Ohio EPA documents supersede the information reported here. However, it is the analysis of the site specific information that provides the basis for the assignment of causes and sources in the 305(b) report. Subbasin boundaries are referenced in Map 2-4 and major streams (>100 sq. mi. drainage area) are illustrated in Map 2-5.

Section 3

Designated Use Support

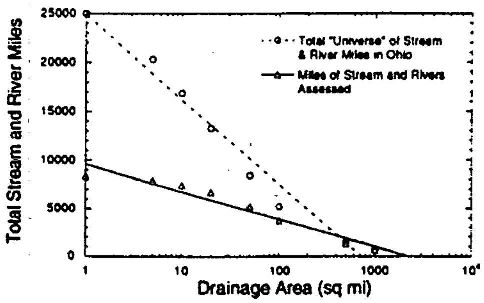


Figure 3-1. Total designated stream and river miles in Ohio and the total stream and river miles assessed by drainage area (measured at the downstream end of a waterbody segment).

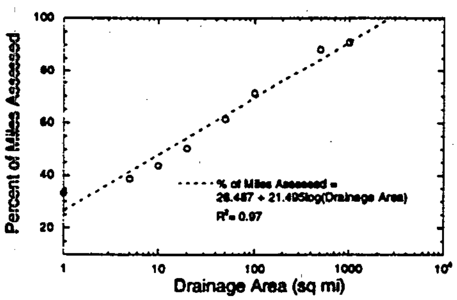


Figure 3-2. Proportion of designated stream and river miles assessed in Ohio by drainage area (measured at the downstream end of a waterbody segment).

Streams and Rivers

Aquatic life use support for this report is based on the assessment of 8,337 miles of streams and rivers (Table 3-1). This is 28.6% of the 29,113 miles of perennial streams miles or 13.5% of the 61,532 total stream miles in Ohio estimated to exist in Ohio by the U.S. EPA (see Section 2). Summary pie charts for all beneficial uses for rivers and streams, inland lakes, ponds, and reservoirs, and Lake Erie are arrayed at the end of this section in Figure 3-10. Although our sampling stragegy is a focused rather than probabilistic one, our coverage on larger rivers is extensive (Figure 3-1 and 3-2). We have assessed 91% of rivers of greater than 1,000 sq mile drainage and 50% of all streams not considered headwaters (i.e., > 20 sq mi; Fig. 3-2). Thus, concern with database biases related to extrapolation from small sample sizes decreases with increasing stream size.

"Stream and river surveys...revealed widespread impairment from inadequately treated municipal and industrial wastewater."

Stream and river surveys in Ohio during the 1970s and 1980s revealed widespread impairment from inadequately treated municipal and industrial wastewater. Only 34.3% of streams and rivers fully supported aquatic life use criteria based on monitoring data collected prior to 1988 (Fig. 3-3). There has been a trend of improving stream and river resource quality in Ohio since the 1980s, however, largely as a result of improved treatment at WWTPs. Data collected during the late

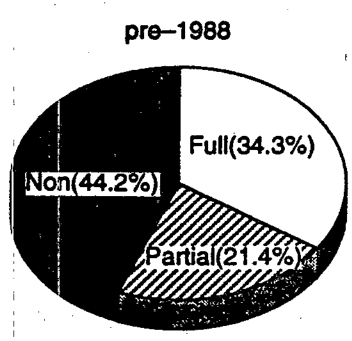


Figure 3-3. Full (open wedge), partial (hashed wedge), and non support (shaded wedge) of aquatic life criteria in Ohio streams and rivers based on monitoring information used in the 1988 305[b] report.

Appendix G

Examples of 305(b) Wetlands Information

Kewaunee County—Mapped Wetlands Two Acres Or More In Size*

WETLAND TYPE	1978 REPORTED ACREAGE (Second Most Recent Acreage)	MOST RECENT ACREAGE (1989)	ACREAGE** LOSS/GAIN	PERCENT CHANGE
Aquatics	20	0	-20	-100
Emergents	1,261	1,832	571	31
Scrub/Shrub, Deciduous	710	2,599	1,889	72
Scrub/Shrub, Coniferous	22	4	-18	-81
Forested, Deciduous	5,389	20,031	14,642	73
Forested, Conifereous	92	3,240	3,148	97
Open Water	22	49	-27	55
Class Unknown***	24,411	0	-24,411	-100
TOTALS	31,927	27,755	-4, 172	-13

Manitowoc County—Mapped Wetlands Two Acres Or More In Size*

WETLAND TYPE	1978 REPORTED ACREAGE (Second Most Recent Acreage)	MOST RECENT ACREAGE (1989)	ACREAGE** LOSS/GAIN	PERCENT CHANGE
Aquatics	49	0	-49	-100
Emergents	4,853	7,811	2,958	38
Scrub/Shrub, Deciduous	2,937	6,635	3,698	56
Scrub/Shrub, Coniferous	30	25	-5	-17
Forested, Deciduous	21,828	30,072	8,244	27
Forested, Conifereous	502	3,932	3,430	87
Open Water	186	393	207	53
Class Unknown***	24,824	0	-24,824	-100
TOTALS	55,209	48,868	-6,341	-11

* Wetland acreage estimates are based on the 1978 Wisconsin Wetland Inventory Maps and the 1989 map revisions.

**Wetland acreage increases are due to improved aerial photography and interpretation techniques and reversion of farmed wetlands back to wetland vegetation. Wetland acreage losses are due to improved aerial photography and interpretation techniques and the draining or filling of areas mapped as wetland in 1978.

***The unknown class represents the acreage of large wetland complexes whose internal boundaries were too detailed to digitize under time and budget contraints imposed on the project.

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Table D-5. Development of State Wetland Water Quality Standards

4/5/95

	In Place						Under Development						Proposed					
State	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation	Use Classification	Narrative Criteria	Numeric Criteria	Narrative Biocriteria	Numeric Biocriteria	Antidegradation
Alabama																		
Alaska																		
Arizona								X										
Arkansas																		
California																		
Campo Indian Reservation							X			X	X	X						
Colorado																		
Connecticut		X	X			X	X											
Coyote Tribe							X									X		X
Delaware						X	X	X	X									
Delaware River Basin																		
District of Columbia													X					X
Florida	X			X*		X				X	X					X		
Georgia																		
Guam																		
Hawaii							X						X					
Hoopa Tribe							X									X		X
Idaho																		
Illinois																		
Indiana																		
Iowa	X	X	X	X		X												
Kansas	X			X		X											X	
Kentucky																		
Louisiana																		
Maine										X	X	X						
Maryland																		
Massachusetts	X	X	X									X						
Michigan																		
Minnesota	X	X	X			X				X	X							
Mississippi																		
Missouri						X										X	X	
Montana																		
Nebraska	X			X		X					X							
Nevada																		
New Hampshire																		
New Jersey																		
New Mexico																		
New York																		
North Carolina																		
North Dakota							X			X	X	X						
Ohio						X*	X			X							X	
Oklahoma																		
Oregon						X		X										
Pennsylvania																		
Puerto Rico						X												
Rhode Island	X			X		X												
South Carolina																		
South Dakota	X			X		X	X			X	X	X						
Tennessee																		
Texas																		
Utah						X												
Vermont																		
Virginia																		
Virgin Islands																		
Washington																		
West Virginia																		
Wisconsin		X		X		X		X										
Wyoming																		
Totals	8	5	4	7	0	15	9	4	1	7	7	5	2	0	0	4	3	3

Source: 1994 State Section 305(b) Reports.

X - State reported program status.

* In-place but revisions under development. Revisions include expanding coverage.

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Table D-5 (continued)

State	Implementation Process	Page Number
Alabama	Waters in wetlands are waters of the State, but wetlands are not defined for inherent values, e.g. habitat.	75
Alaska		
Arizona	Waters of the State, protected by standards for adjacent waters only.	47
Arkansas	Arkansas does not have a definition of wetlands, standards for wetlands, or legislation to protect them.	38
California		
Campo Indian Reservation		3-26
Colorado	No information.	
Connecticut	Municipal jurisdiction	Comments
Coyote Tribe	Some uses defined, but incomplete. Narrative biocritieria will be developed as funding permits.	III-20
Delaware	Wetlands are waters of the State; now developing criteria and uses for wetlands.	85
Delaware River Basin		
District of Columbia	District does not identify wetlands as waters of the District, but has narrative standards for wetlands?	91-92
Florida	Wetlands are waters of the State, regulated using the same standards as other waterbodies.	148-49
Georgia	Include wetlands as waters of the State.	30
Guam		
Hawaii		III-96
Hoopa Tribe	Some uses defined, but incomplete. Narrative biocritieria will be developed as funding permits.	
Idaho		
Illinois		
Indiana	Wetlands are waters of the state so standards apply to wetlands.	372
Iowa	Section 401, wasteload allocations, specific wetlands identified in State standards.	3-233-235
Kansas	Waters of the State, minimum designations for noncontact recreation and aquatic life support.	36
Kentucky	Wetlands are waters of the State, but standards do not have specific wetlands criteria.	2-4
Louisiana		
Maine	No regs for implementing Section 401.	73
Maryland		
Massachusetts		
Michigan	Will consider specific definition of wetlands as waters of the State in next triennial review.	177
Minnesota		III-22, 26
Mississippi	Wetlands-specific standards under consideration.	
Missouri	Wetlands not defined in State standards.	
Montana	Standards for lakes and rivers apply to wetlands, but may not be technically appropriate.	54
Nebraska	Specific wetlands standards in 1993, incl designated uses, narrative criteria, numeric toxics criteria.	32
		185
Nevada	No information	
New Hampshire	Wetlands are waters of the State but criteria have not been defined for wetlands.	III-6-5
New Jersey	Wetlands are waters of the State; in the near future, New Jersey will develop standards for wetlands.	V-27
New Mexico	Wetlands are waters of the State, designated for livestock and wildlife use. Specific standards in 1996-97.	175
New York		
North Carolina		
North Dakota		45
Ohio	Developing wetlands specific criteria.	145
Oklahoma	Currently, there are no specific water quality standards for wetlands.	
Oregon	Existing surface water standards apply to wetlands, but may not protect special wetlands functions.	3-54
Pennsylvania	Waters of the Commonwealth, but no specific standards for wetlands until EPA provides guidance.	104
Puerto Rico	No standards or designated uses for wetlands, but antidegradation applies to wetlands.	99
Rhode Island	State Section 401 Wetland Permit	III.F-3
South Carolina	Wetlands assume standards of adjacent waterbodies; SC is considereing wetlands-specific standards.	99
South Dakota	Wetlands are waters of the State, designated for wildlife propagation and stock watering.	
Tennessee		
Texas	Waters of the State; considering wetlands standards and clarifying general criteria applied to wetlands.	168
Utah	Antidegradation applies to wetlands, waters of the State.	142
Vermont		
Virginia	Inlcude wetlands as waters of the State; will consider including wetlands in narrative standards next review	93
Virgin Islands		
Washington		
West Virginia		
Wisconsin	Some criteria in place, some proposed	
Wyoming	Waters in wetlands defined as waters of the State, so wetlands quality is protected but not their existence.	293
Totals		

Source: 1994 State Section 305(b) Reports.

Background

Minnesota has made several advances in wetland protection and management during 1992 and 1993 including promulgation of two regulatory measures for the protection of wetlands. They include:

1) The administrative rules adopted by the Minnesota BWSR in accordance with the WCA of 1991; and

2) The development of wetland water quality standards, which will be effective in April 1994. Both these measures provide increased protection of wetlands, which are a key component of water resources in Minnesota.

WCA Implementation

The Board of Water and Soil Resources (BWSR) completed Minnesota Rules ch, 8420 which regulate the implementation of the WCA of 1991 by Local Government Units (LGU). Local government units include cities, counties, townships, soil and water conservation districts and watershed management agencies. The rule which took effect January 1, 1994 requires the LGU to regulate drain and fill activities in all wetlands that are not included as *public waters wetlands*. *Public waters wetlands* are the wetlands listed on the Protected Waters Inventory regulated by the MDNR under Minnesota Statute 103G. Under the WCA, certain wetland types, sizes and activities are exempted from regulation by the LGU. Regulations implementing the WCA provide authority to the LGU to grant one or more of 25 exemptions for certain project types. These exemptions principally apply to proposed land use activities on smaller less inundated wetlands. The LGU's are required to confirm to BWSR their acceptance of the responsibilities to administer requirements of the WCA and to indicate their jurisdictional area.

One of the strengths of local government regulation is their relative closeness to the wetland resource and their ability to integrate mandated wetland protection efforts with the local zoning and planning responsibilities. Another anticipated advantage to LGU administration of these wetland protection measures will be effective follow up monitoring and enforcement of conditions included in wetland replacement plans.

A challenge to this newly implemented local regulation will be for BWSR to coordinate the many officials in all cities, townships, counties, SWCDs and watershed management organizations that seek approval to implement this program within their jurisdiction. Training, program interpretation and application and consistency in wetland delineation will also be a major challenge.

Wetland Water Quality Standards and Authorities

Following USEPA guidance the MPCA recently developed narrative water quality standards for wetlands, as part of several revisions to Minnesota Rules ch. 7050. Following solicitation of outside opinion, a 30 day public notice period of the proposed rule, six administrative hearings and two appearances before the MPCA Citizens Board, Minnesota adopted the final rule on January 25, 1994. The following are the amendments pertaining to wetlands that were added to Minnesota Rules ch. 7050 during the 1993 triennial review of water quality standards:

1) Define wetlands in the water quality standards.
2) Assign water use classifications for wetlands.
3) Adopt narrative nondegradation standards to protect wetlands from harmful or otherwise objectionable conditions resulting from human activities.
4) Apply nondegradation standards to wetlands through wetland mitigation sequencing (avoid, minimize and mitigate).

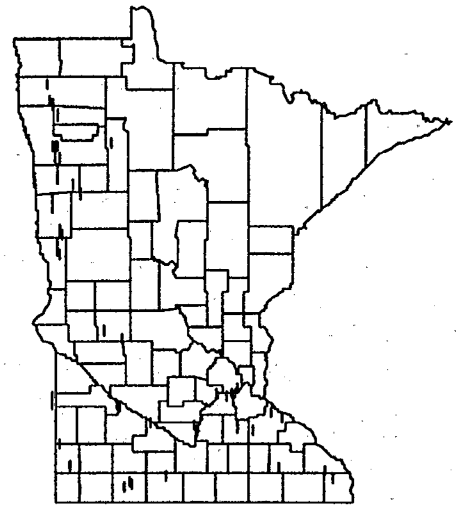
Minnesota Rules ch. 7050 defines wetlands as: "those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Constructed wetlands designed for wastewater treatment are not waters of the state. Wetlands must include the following attributes:
1) A predominance of hydric soils.
2) Inundated or saturated by surface water or ground water at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in a saturated soil condition.
3) Under normal circumstances support a prevalence of such vegetation."

Wetlands have been assigned the following designated uses in the water quality standards: Class 2D wetland waters are protected in support of aquatic life and recreational uses. Dissolved oxygen levels in backgrounds less than 5.0 mg/l daily minimum must be maintained at background, pH and temperature must be maintained at background levels. Class 3D wetland waters are protected in support of industrial uses. Chlorides, hardness and pH must be maintained at background levels. Class 4C wetland waters are protected for irrigation use and for uses of wildlife, livestock, erosion control, ground water recharge, low flow augmentation, storm water retention and stream sedimentation. In protecting these uses, pH must be maintained at background levels and settleable solids must not accumulate in amounts that result in a loss of use. Class 5 wetland waters are protected in support of aesthetic enjoyment and navigation. For protecting these uses, pH and hydrogen sulfide must both be maintained at background levels.

Through application of these narrative wetland standards, degradation of wetlands from permitted activities will not be allowed. To avoid this degradation associated with permitted activities, these activities are required to be avoided, minimized and in addition any unavoidable physical alterations must be adequately compensated by the replacement of the wetland acreage to satisfy the No-Net Loss Policy of the state. Physical alterations of wetlands would include activities resulting in loss of designated uses associated with filling, draining, excavating or inundating wetlands. Restoration of drained or degraded wetlands would not be considered a physical alteration.

Minnesota recognizes certain significant waters as ORVWs. In some instances wetlands are included in this designation. For example, a wetland is designated as an ORVW when located in a Scientific and Natural Area as designated by the MDNR. In addition, calcareous fens are listed as ORVWs because of their unique floral and faunal communities and their relative sensitivity to impact including hydrologic changes. Calcareous fens are identified and located by the MDNR (see Figure III-8). During each triennial revision of the water quality standards newly identified calcareous fens are considered for listing as ORVWs in state water quality rules.

Figure III-8. Location of 75 Calcareous Fens Listed as Outstanding Resource Value Waters in Minnesota Rules



Prior to this standards revision, state statutes included all waters, including wetlands, as "waters of the state." Therefore, wetland waters were already protected by the water quality standards. The standards developed are more appropriate to the wetlands resource and clarified the application of nondegredation policy to wetlands. The inclusion of a specific definition of wetlands as part of the revised standards was also requested by USEPA.

Another tool used to protect wetlands is Minnesota Executive Order 91-3. This Executive Order mandates that all state agencies protect, enhance and restore Minnesota's wetlands to the fullest extent of their authority. The Executive Order also established a strict policy of No-Net Loss of wetlands in the state that applies to projects under state agency jurisdiction. The revised water quality standards comply with this directive from the Governor and the MPCA continues to operate under that executive directive.

Figure III-9. Water Quality Measurements of 30 Reference Wetlands for Total Suspended Solids (in mg/L) and Turbidity in ntu Units

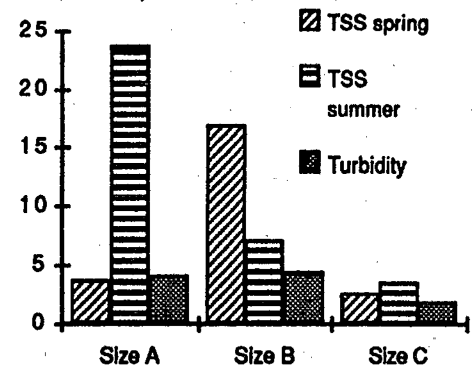
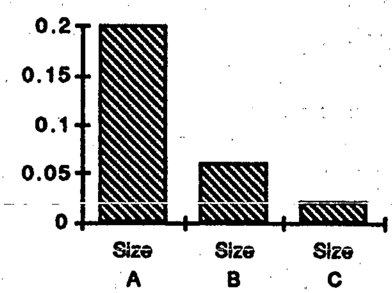


Figure III-10. Summer Values of Orthophosphate (in mg/L) for 30 Reference Wetlands



In Figures II-9 and III-10, 30 reference wetlands are grouped into three size classes:

Size A: 1.8 - 2.0 acres,
Size B: 2.1 - 3.5 acres, and
Size C: 3.6 - 34 acres.

Permit Simplification Activities

In Minnesota there are multiple levels of government involved in regulating activities in wetlands. The LGU administers provisions of the state WCA and the MDNR regulates wetlands designated as Public Waters Wetlands. The USCOE administers provisions of the CWA Section 404 program for all waters of the United States and Section 401 Water Quality Certification is provided by the MPCA.

State agencies including the BWSR, MDNR, MDOT, and MPCA, and federal agencies including the USCOE, USFWS, USEPA (Region 5) and the SCS are working together in an ongoing task force to resolve issues of wetland regulation in Minnesota. These agencies drafted a Memorandum of Understanding (MOU) that states the intent of the agencies to continue cooperation in simplifying wetland permitting activities. As a result of this cooperation the agencies requiring applications for permitting or approval of wetland activities have developed a single joint notification and application form. An applicant may fill out an application document and mail copies to the five agencies listed on the form. This satisfies initial application requirements in a single action. The USCOE has issued a public notice for a General Permit that will provide 404 permit approval for certain activities when they are approved by the LGU under the WCA.

Nationwide Permit Negotiations

Nationwide permits are issued by the USCOE under the CWA Section 404 program. The MPCA certified some of the nationwide permits with conditions, and denied certification for some of the nationwide permits due to water quality concerns. The USCOE and the MPCA negotiated acceptable Regional Conditions and Certification Conditions for the various certified permits. Conditions were applied to nationwide permit number 26, the most commonly used nationwide permit in Minnesota,. 1) limiting its application to projects impacting less than three acres of wetland, 2) limiting its application to projects that do not impact ORVW, and 3) requiring notification of the MPCA, the MDNR, the Minnesota Office of Historical Preservation, the USFWS and the USEPA when the proposed project impacts 0.5 acres or more of wetland.

Storm Water Impact to Wetlands

Nonpoint source runoff and point source storm water significantly increase pollutant loadings to surface and ground waters. As these problem sources continue to be studied, different elements of the runoff flow characteristics and pollutant loads associated with them are correlated with the varying landscapes in Minnesota. Agricultural, forested, industrial, commercial areas and urban runoff all pose different challenges to provide either source reduction or BMPs to reduce water quality degradation caused by runoff in these areas. A common water quality BMP in many of these land use situations involves natural wetland basins in the watershed. Natural wetland basins provide water quality benefits to the watershed and the protection and restoration of wetlands for water quality improvement is a frequently used BMP.

Storm water management and the associated impact to wetlands in the urban area are among issues currently being explored by a federal, state and local agency task group. The MPCA promotes construction of storm water retention or treatment ponds in developing areas and the preservation of natural wetland basins as part of wetland protection efforts. Construction of storm water ponds and the preservation of natural wetland basins is sometimes difficult to achieve in developing areas where other incentives may be pushing for maximizing land development. The task group on Urban Storm Water has a mission to develop design criteria and wetland impact policy for storm water management and treatment and offer this information through publication and conferences to the many local, state and federal government agencies that regulate activities involving storm water and wetlands impacts.

Surface water planning is a component of local government, while the permitting for the draining or filling of wetlands associated with the implementation of these plans may involve state and federal authorities. Therefore, development of design criteria for storm water management systems is needed to achieve the desired treatment goals of all interests. Development of a policy for implementation of these design criteria is needed to ensure consistent wetland protection at all levels of government, thereby reducing the potential for government gridlock over projects where responsibilities may overlap.

Representing a predominantly agricultural area of the state, the Minnesota River basin study documented the importance of wetlands with relation to peak flow, sedimentation and chemical pollutants in tributaries and the main river stem. The study should lay a foundation for developing BMPs, wetland protection and wetland restoration techniques to achieve much needed water quality improvements in the watershed.

Comprehensive Wetland Planning

Beginning in July of 1993, Minnesota began a statewide comprehensive wetland conservation planning effort. The MDNR is facilitating this ongoing effort to coordinate existing local, state and federal wetland programs resulting in more effective management of wetland resources. As part of this planning effort, overall statewide wetland goals will be articulated and guidance will be developed for linking these goals with local decision makers. Participants in the planning process include representatives from: state associations of cities, counties, watershed districts and SWCDs; state agencies including MDA, BWSR, DNR, MPCA and MDOT; federal agencies including the USCOE, USFWS, SCS, and Federal Highway Administration. The planning process will establish clear objectives for the state's wetland resources for the future, integrating existing regulatory and nonregulatory wetlands programs at all levels of government and identify new programs and strategies required to achieve the plan's objectives.

Basin Planning Initiative

The MPCA is developing a basin planning and management approach and at the same time is moving toward more quantitative and criteria based decision making. In making this shift the MPCA recognizes that there is only minimal existing water quality monitoring information available for wetlands. Therefore, one of the principal needs is to provide consistent monitoring methodologies for wetlands. Efforts are being formulated by the MPCA for initial water quality monitoring of wetlands in priority watersheds of selected basins. One benefit of this effort is to develop a multiple tiered approach for assessing designated uses of the wetland as part of these monitoring efforts. This multiple tiered assessment methodology would include working with local government units and citizens.

The Reference Wetlands Project

The MPCA has undertaken a reference wetland project to develop the basis for assessing the biological and chemical health of wetlands in Minnesota. The project, originally funded by the Legislative Commission on Minnesota Resources through the Environmental Trust Fund, is currently funded by USEPA through the Office of Research and Development. Biological assessment is important because changes in species composition can reflect pollution or habitat alteration. In addition, biological communities are a key to understanding whether restored wetlands can achieve a condition comparable to natural wetlands. This requires knowledge of reference wetlands that have had minimal disturbance.

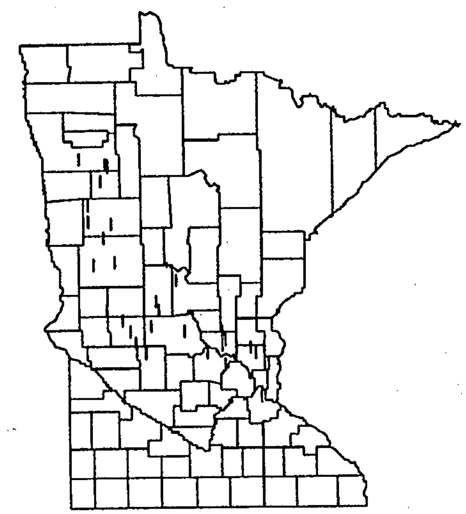
Thirty-five isolated or depressional wetlands including three impact sites were selected in seventeen counties in the North Central Hardwood Forest Ecoregion in Minnesota (Figure III-11). These reference wetlands are located largely on public lands managed by Macalester College, the Nature Conservancy, MDNR Heritage Program, MDNR Wildlife, St. John's University, University of Minnesota and the USFWS (WPA's). Invertebrate communities were the main focus of study, but vegetation, amphibians, land cover around the wetlands, water and sediment chemistry were also analyzed.

Wetland water quality is surprisingly high with very clear water, low TSS (Figure III-9) and low orthophosphate (Figure III-10). Turbidity in the reference wetlands is in the range of the clearwater lakes of Northern Minnesota. In summer, water in the smaller sites becomes more chemically concentrated as they dry down. Sites less than two acres had higher TSS and orthophosphate in the summer than in the spring, while larger sites tended to have low TSS and lower phosphate in summer (Figures III-9 and III-10). Where conductivity, a measure of overall ionic concentration, is higher, there are greater numbers of some invertebrates in the wetlands.

Biologically the reference wetlands are very diverse. Invertebrates that act as predators in wetlands include many taxa or kinds of beetles, bugs, dragonflies and damselflies. These feed on a diverse array of herbivorous taxa, like the chironomids or midges, mayflies and caddisflies and crustaceans such as clam-shrimp and scuds. Nesting waterfowl and young ducklings are dependant on the rich invertebrate food source in wetlands. One small reference wetland had over 1,000 clam shrimp per sample, 23 taxa of beetles and five species of young frogs. This productive but temporary wetland was dry by July. A significant relationship exists between the size of the wetlands and the amount of frog reproduction, with smaller sites having more tadpoles per sample than larger wetlands.

Present work involves determining 'guilds' or groups of taxa that indicate the condition of the habitat. There are some significant relationships between crustaceans, mayflies and damselflies to some water quality indicators. The diversity of the sedge family may be another useful indicator. A variety of indicators of wetland health including not just invertebrates, but vegetation diversity and the densities of amphibians is being evaluated. This will lead toward the multimetric or several parameter approaches advocated by USEPA for biological criteria.

Figure III-11. Location of 35 Reference Wetlands in the North Central Hardwood Forest Ecoregion



Wetland Monitoring and Restoration Activities

The MPCA Duluth Regional Office began an effort in 1993 using volunteers to monitor breeding vocalizations of local frog populations in the riverine wetland areas along the St. Louis River. Each of the observation sites was visited three times from April through July. The data presented in Table III-9 shows that frog species vary greatly in their distribution. This difference may be due in part to site conditions and relative sensitivity of the various frog species to pollution related impacts. Similar efforts in other parts of the state including the Twin Cities Metropolitan area will over time provide valuable information about wetland health based on amphibian information. Table III-9 shows the frequency that each species was heard at 50 wetland sites in the first year of the St. Louis River survey. The value reflects the number of sites at which a species' breeding call was heard as a percentage of the 50 sites at which volunteers listened for calls.

Three sites reported hearing what was identified as a pickerel frog. This data is not included in the table because this identification was not confirmed and the sites are out of the normal range of the pickerel frog.

Though there is limited accounting of the status and trends of wetland resource condition in the state, several resource agencies have contributed to the restoration of the wetland resource base in Minnesota. Table III-10 shows approximate totals of restored wetland acres in three regions of Minnesota, as recorded by the USFWS and the SCS during 1992 and 1993. The majority of these restorations involved depressional or riverine wetlands concentrated in the prairie pothole region of the state. It should be noted that these figures of restored wetland acres represent best estimates of projects completed and/or under contract by the respective agencies.

Table III-9. Frequency of Frog Occurrence

Wood Frog	54%	American Toad	30%	Number of samples = 50,
Chorus Frog	40%	Gray Treefrog	44%	Data collected during the
Spring Peeper	80%	Mink Frog	4%	1993 St. Louis River
Leopard Frog	14%	Green Frog	12%	Vocalization Survey

Table III-10. Restored Wetland Acres by Region in Minnesota during 1992 and 1993 (Courtesy of the USFWS and the SCS)

Region	1992 Acres	1993 Acres
Prairie Pothole Region	3,370	3,276
Central Hardwood Forest Transition Region	896	583
Northeast Forest Region	31	15

The BWSR restored 210 wetland acres statewide in 1992 and 349 acres as part of the first of two application cycles in 1993. The MDNR cooperated in many of these restorations and conducted some of their own restoration projects. Many private organizations and interests were involved in restoring these wetland acres, and have conducted wetland restorations without direct assistance from federal agencies. It is extremely difficult to establish the total number of restored wetland acreage in Minnesota because of the large number of agencies and private groups or interests that cooperate in many wetland restoration projects. In the future, it is expected that tracking of wetland restoration projects will improve with the advance of GIS data, technology and techniques.

Minnesota recently completed the digitization of the USFWS National Wetland Inventory. This database is now undergoing field testing. Application databases are currently in development at the MDNR in cooperation with the state Land Management Information Center.

Future Activities and Needs

Minnesota is striving to integrate wetland resource planning activities into the basin planning and management initiative. Key elements to this task include the geographic targeting and prioritizing of wetland resources to manage more effectively priority wetlands on a watershed basis. In the future, wetland monitoring and assessment information will be used to make resource management decisions. It is also recognized that improvements need to be made in linking wetland protection goals to other surface and ground water protection efforts.

Appendix H

Examples of Basin-Level Assessment Information

Middle Gila River Basin

The Middle Gila River Basin **(Map 18)** encompasses 12,150 square miles, and includes the Phoenix metropolitan area. Almost two-thirds of the State's population resides in this basin. The historical land use in the Middle Gila Basin was agricultural; however, in the metropolitan area agriculture has been displaced by 30 years of almost exponential population growth. Surface water diversions in the Gila River and the Salt River for agricultural and urban uses have left the streambeds in the Phoenix area dry. The basin also includes two Indian Reservations, portions of two National Forests, and 11 designated Wilderness Areas. The basin receives limited rainfall; therefore, surface water flow in this basin is primarily attributable to releases from upstream impoundments, effluent from wastewater treatment plants, and/or agricultural return flows.

The Arizona Department of Health Services released a human health risk report in 1991 entitled "Risk Assessment for Recreational Usage of the Painted Rocks Borrow Pit Lake at Gila Bend, Arizona". This report indicated that a greater than acceptable lifetime cancer risk could result from long-term consumption of fish from this impoundment and upstream along Gila River. Specifically, ADHS found that there would be a greater than a one-in-a-million lifetime (70-year) risk of cancer associated with DDT metabolite ingestion by eating (8 ounce portions) 3.5 meals per month, and methylmercury toxicity would be expected to occur at a consumption level approaching eight meals per month. As a result, a fish consumption advisory was issued on October 3, 1991, warning people not to eat fish, turtles, crayfish or other aquatic organisms from portions of the Salt, Hassayampa, and Gila rivers (the Gila River between the confluence with the Salt River to Painted Rocks Lake, the Hassayampa River near its mouth, and the Salt River below the 23rd Ave in Phoenix). Camping, boating, fishing, other recreational uses and public access have been prohibited since the Painted Rocks Lake State Park was closed in January, 1989. Management of the area has reverted back to the U.S. Army Corps of Engineers and the Bureau of Land Management through actions by the State Parks Board. These two federal agencies are considering proposals to reopen the lake facilities to the public.

Sediment borings from the Gila River were tested for organochlorine pesticides and heavy metals as part of a Painted Rocks Lake diagnostic/feasibility study by the Clean Lakes Program (The Earth Technology Corporation, 1993). Results indicted that the continued loading of DDT metabolites, toxaphene, and mercury can be expected from the watershed. A disparity between high biota contaminant concentrations and low sediment concentrations suggests that the food web acts as a filtering mechanism for the removal and concentration of toxic lipidophilic contaminants (DDT metabolites, toxaphene, and mercury). Extensive agricultural area in the watershed is the assumed source for the DDT metabolites and toxaphene, while the potential sources of mercury contamination include the watershed's natural geology, mining activities (historic use of mercury to leach precious metals), landfills, and treated sewage effluent. Several restoration techniques were proposed to mitigate the eutrophic conditions at the lake; however, these proposals were costly and would not resolve the ongoing pesticide loading from the watershed.

The USFWS has begun collecting fish and predatory birds along the lower Salt and Gila Rivers (from 59th Avenue in Phoenix to the Colorado River) and will be testing their tissues for organochlorine pesticides and heavy metals. This is a follow up to the extensive monitoring completed by the USFWS in this area in 1985-1986. In the present study sediment samples will not be collected because they were not a reliable indicator of the level of contamination in resident wildlife. USFWS is also attempting to collect soft-shelled turtles for comparison to previous collections, but has so far been unsuccessful.

Two projects provided information concerning the existing level of contamination by organochlorine pesticides in agricultural fields, a source of aquatic contamination in this watershed. In one project samples were collected along the edge of cultivated fields, adjacent to roadway shoulders (SCS Engineers, 1991). Any residues of organochlorine pesticides in these locations would represent the results of overspray, rather than direct application. Varying degrees of soil disturbance due to road grading and field plowing were observed, and areas where disturbed soils appeared to have originated from road grading activities were avoided. Also areas where significant runoff or irrigation water accumulated were avoided. Soil samples collected at approximately 6 inches below ground surface indicated extensive residual pesticide contamination in these areas, and that human consumption of the soil is probably not advisable. A summary of these soil sample results and the USFWS sediment sample results are indicated in the following table:

PESTICIDE	RANGE IN SOIL* (mg/kg)	HBGL* (mg/kg)	RANGE IN STREAM SEDIMENTS* (mg/kg)
DDT METABOLITES	0.07-5.13	4.0	<detection level-0.44
TOXAPHENE	<detection level-18.0	1.2	<detection level
TOTAL PESTICIDES	0.38-23.86	--	--

* Soil sediments collected by SCS Engineers (1991).
HBGL = Health Based Guidance Level established by the Arizona Department of Health Services for human consumption of soil.
Stream sediment samples collected by the USFWS in 1985-87 in the Painted Rocks Lake study area.

A second study of organochlorine pesticide levels associated with historic agricultural areas in the Middle Gila River Basin was completed by ADEQ and published as a masters thesis (Brown, 1993). Soil samples were collected at two depths in fields which had been fallow for at least 5 years, and sediment samples were collected in drainage areas associated with these fields. Only DDT metabolites and toxaphene were detected in the ranges that are indicated in the table at the bottom of this page.

Another pesticide study was conducted in the Maryvale area of Phoenix (ADEQ, 1992d). A study of residual pesticide levels was initiated because of a childhood leukemia cluster in the Maryvale area of Phoenix, and the area of concern had been previously in agricultural fields. Soil samples were collected around 10 sites (residents, parks, schools, and agricultural sites) in 1989-1990. DDT metabolites, toxaphene, heptachlor, and aldrin were detected at levels higher than the Health Based Guidance Level established by ADHS for human ingestion of these pesticides in soil. Ziram, a fungicide and seed treatment, was also detected, but no guidance level has been established. Toxaphene was the only pesticide detected over the guidance level at an athletic field or public level, the other exceedances were confined to samples taken around structural foundations. This suggests that these residues resulted from application to the foundations as structural pest control. There is also DDT and toxaphene residue that appears to be correlated with agricultural activity. This study did not answer questions about health risk, if any, that these residuals may pose to the population. The study had three recommendations:

- Further soil testing to characterize the nature and distribution of DDT and toxaphene in Phoenix area.
- The guidance levels for DDT and toxaphene should be expanded to consider risks from inhalation exposures.
- A human health risk assessment should be conducted by ADHS of the total DDT and toxaphene levels found in Phoenix area.

During the winter floods of 1992 and 1993, the Salt River flooded and inundated a portion of the Tri-City Landfill on the Salt River Indian Reservation that served several cities and institutions in the Phoenix metropolitan area. Although only a minor portion of the landfill was carried

PESTICIDE	SOIL AT 0-15 cm (mg/kg)	SOIL AT 15-30 cm (mg/kg)	CHANNEL SEDIMENT (mg/kg)
DDT METABOLITES	0.014-0.93	0.02-0.59	0.02-0.195
TOXAPHENE	<detection level-0.60	0.02-0.195	0.03-1.20

* Soil and sediment samples collected by ADEQ Pesticide Unit (Brown, 1993).

away, thousands of tons of debris being swept into the floodwaters, to be deposited along the Salt and Gila rivers shorelines for more than 100 miles. EPA and the Army Corps of Engineers have been working with the Tribal government to mitigate these problems (the State lacks jurisdiction). Currently, a portion of the landfill is being moved out of the floodplain. The part that will remain must be protected from future floods and natural shifts in the river channel.

During the January 1993 record breaking floods, ASARCO Hayden Tailings discharged approximately 220,000 cubic yards of tailings into the Gila River. Tailing deposits along the banks were documented, and voluntary actions to remediate were initiated, however, the tailings have now spread out to such an extent that remediation may not be possible. Also during this flood, Black Canyon City Auto Parts discovered that keeping salvage cars in the Squaw Creek floodplain can lead to an annoying "distribution of assets", as the vehicles were swept down into the Agua Fria River. The owner has removed them from the streambed, but deposited them on State Land without permission. Further enforcement action is still pending.

Portions of the federal Superfund site located at Phoenix's 19th Avenue Landfill are located within the 100-year floodplain of the Salt River. Flooding in 1979 raised the water table, filled several disposal pits, breached several dikes, and washed refuse into the river. Refuse in the landfill contains volatile organic compounds (VOCs) and pesticides; the soil contains VOCs, polychlorinated biphenyls (PCBs), and pesticides; the groundwater contains VOCs, heavy metals, and beta radiation; and excessive methane gas is being produced. Earthen berms have been constructed to mitigate further surface water contamination. Cleanup of this site is to begin as soon as the design phase is completed (EPA, Sept. 1990a).

The U.S. Army Corps of Engineers initiated a feasibility study, known as Tres Rios, for seven miles of the Salt and Gila rivers below the 91st Avenue Wastewater Treatment Plant. The project would create an artificial wetland to provide additional treatment of secondary treated effluent from the plant.

Surface water (McKellips Lake) within the Indian Bend Wash federal Superfund site is contaminated by VOCs. In this 12 square mile Superfund site, VOCs, cyanide, acids, and heavy metals from several industrial facilities have contaminated the soils. Groundwater is contaminated with VOCs, boron, methane, chloroform, lead and zinc. Further studies are taking place and cleanup activities are planned (EPA, 1990a).

Results from a cooperative monitoring station on the Gila River within the Gila River Indian Community is indicated in the basin discussion for information purposes. This section of the Gila River was not assessed. Total dissolved solids exceed 1000 mg/l on the Gila River below San Carlos Reservoir. At a downstream monitoring station, near the Gila River Indian Community, TDS ranged between 7160-9090 mg/l in 1990. Elevated salts and high boron are attributed to the agricultural return flows from Broadacres Farm on the Gila Indian Reservation. Broadacres Farm utilizes City of Chandler effluent and shallow saline groundwater to irrigate saline soils. The high levels of TDS did not affect the assessment of this reach, because it is not protected for Agricultural Irrigation or Domestic Water Source uses; nonetheless, this contamination may contribute to downstream irrigation limitations.

The Gibson Mine, which is located on a ridge near Globe, Arizona, has documented surface water violations in two watersheds: Salt River Basin and Middle Gila River Basin. The mine produced high grade copper ore between 1906-1918, until the underground workings apparently collapsed. Since then the mine has been operated sporadically to produce copper from the ore dumps. In response to a complaint in 1990, samples taken along Mineral Creek and its tributary revealed that designated uses were impaired by cadmium, copper, zinc, manganese and low pH. (See also the Gibson Mine discussion in the Salt River Basin.) In 1993, the Attorney General entered into a consent decree with the chief lessee, requiring engineering studies in preparation for remediation actions. Engineering studies have been completed, reviewed, and approved. However, subsequently the operation was discontinued, and there have been insufficient funds to initiate remediation actions as approved. Owners were also found to be responsible for certain discharges and the Attorney General's Office has given the owners a Notice of Violation. Negotiations are in progress with the owners.

The Ray Mine is also located on Mineral Creek, and has numerous documented water quality violations below the mine. The U.S. Department of Justice is reviewing an enforcement order by EPA through its NPDES permit.

Complaints of a green stream in Queen Creek revealed that a culvert had become plugged, backing water up behind a railroad embankment that contained copper ore. Magma Copper quickly resolved this problem upon notification, investigated further, and corrected similar situations at other locations along the creek.

At the McCabe-Gladstone Mine a seeping tailings pond was discovered to be contaminating groundwater and surface water with cyanide. A notification of ownership change stimulated an investigation of the operation through the Aquifer Protection Permit Program. This mine is located in the Agua Fria drainage on an unnamed tributary to Galena Gulch. As a condition of sale to Magma Gold in 1992, Magma has completed a hydrogeologic study below the tailings pond, and is to remediate the existing water quality problems. Meanwhile, Magma restarted the mining operations without using additional cyanide. Enforcement action is pending, based on remediation actions taken by Magma.

The Vulture Mill site near the Hassayampa River in Wickenburg was investigated by ADEQ in 1992 and 1993, following the death of one colt. Although toxic poisoning of the colt could not be proven, surface water ponding at the site was heavily contaminated with heavy metals. Subsequently, hogs have been removed from contact with tailings. Water drainage has been captured and the animal waste lagoon, which had contained excessive levels of mercury, lead and other heavy metals, has dried up. Currently, only low level groundwater contamination is detected on site. The owner has initiated arrangements to have the tailings processed if they contain sufficient amounts of gold.

Investigations in 1990 at Zonia Mine, near the headwaters to the Hassayampa River, revealed contamination of surface water with cadmium, copper, manganese, mercury, zinc, and TDS, and a low pH. EPA issued a Findings in Violation order against the owner in 1991. The owner has leased the mine to Arimetco Mining Co, which has completed substantial remediation activities to eliminate leaks at the leach basins. A hydrogeological study of the area was completed in 1993, which is currently under review by EPA and ADEQ. Arimetco plans to restart the mining operations under an Aquifer Protection Permit. Enforcement action against the owner has been halted by EPA as remediation actions continue.

Abandoned mines have contaminated groundwater, surface water and stream sediments at several other sites in this watershed. For example:

- The abandoned Maricopa Mine along Cave Creek has discharged ore and tailings into this ephemeral wash, as evidenced by elevated chromium and lead in sediment samples.

- Surface water monitoring along Turkey Creek (a tributary of the Agua Fria River) at Golden Belt Mine exhibited contamination by arsenic, cadmium, copper, cyanide, lead and mercury.

- In the Agua Fria River headwaters: copper and mercury violations occur near Arizona Victory Mine, copper and zinc violations occur at Walker Mine, mercury violations occur at Knapp Gulch, copper violations occur at Transcendent Mine.

- Below the Holiday Girl Mine (Hassayampa River headwaters) mercury exceeds standards and dissolved oxygen is below required levels.

- Monitoring below the Senator and Cash mines in the Hassayampa River Basin indicate violations of cadmium, copper, zinc, and low pH values.

- Turbidity violations occur below Wagoner Mine.

Prior reports of groundwater and soil contamination with VOCs at Luke Air Force Base (near the Agua Fria River) have been extensively investigated. In 1993, a "record of decision" indicated that all eight soil sites had levels of contamination above the detection level but below "action levels" for remediation. The Air Force Base has decided to bio-remediate one site to eliminate any potential that contamination could spread onto adjacent private land. The investigation of groundwater contamination continues, but preliminary data indicate that contamination may be below "action levels" for remediation. A record of decision concerning groundwater contamination is to be completed in 1996.

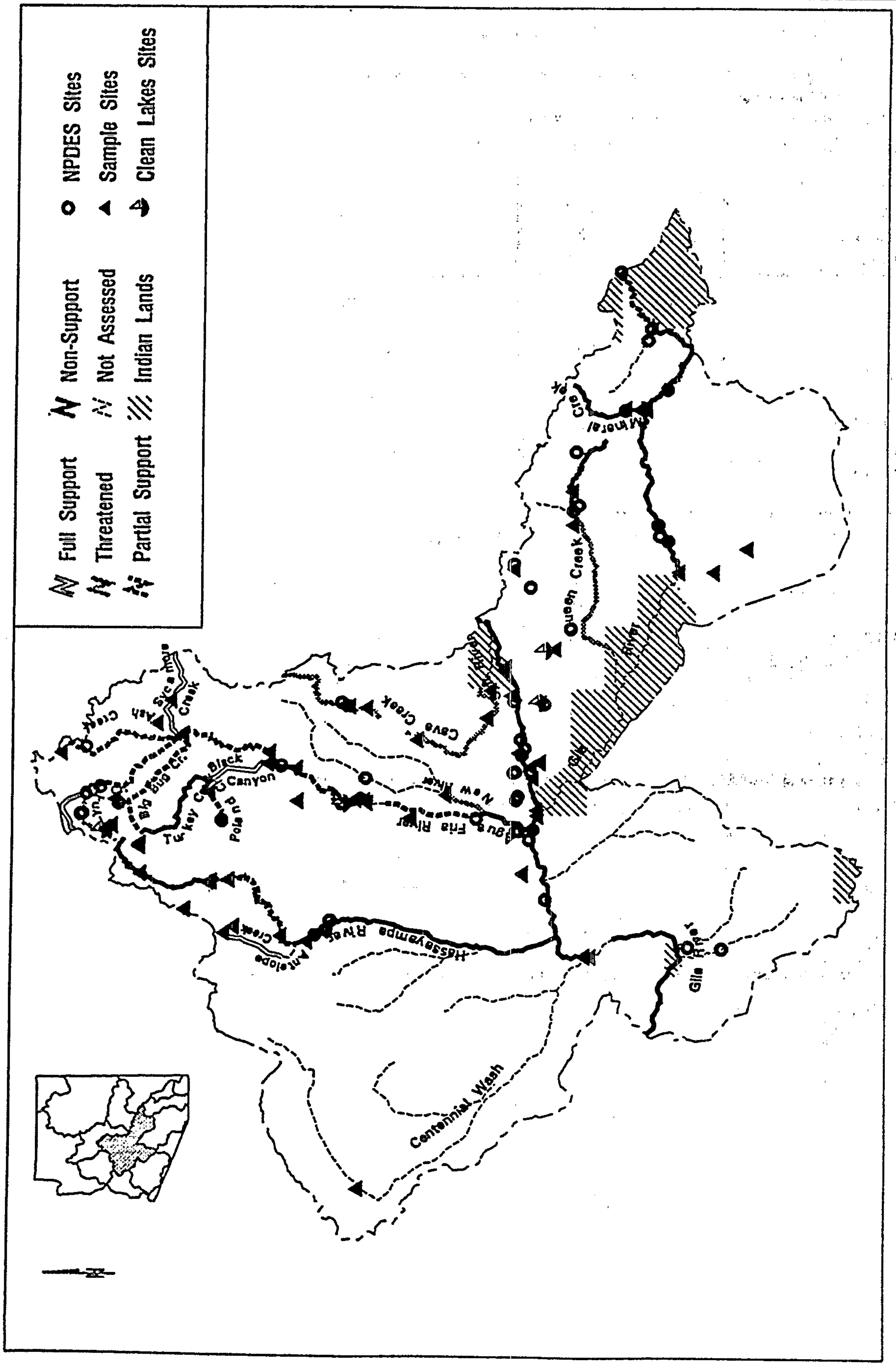
Luke Air Force Base has also been in non-compliance with the NPDES permit for many years. In the summer of 1994 Luke will complete the construction of a six million dollar tertiary wastewater treatment plant. Initial testing indicates that the effluent will be better than surface water standards and permit requirements.

There have been documented violations of surface water quality from National Metals in Phoenix due to precipitation runoff. The runoff flows to a ditch, which discharges to the Salt River at about 31st Avenue in Phoenix. Enforcement and mitigation actions are in progress.

ADEQ's annual water compliance report has indicated that several NPDES permits in this basin have chronically been in non-compliance (see **Appendix C** for current compliance). Toxic monitoring in the Salt River by the City of Phoenix (April 1987-1989) indicated several toxics that exceeded water quality standards. However, since completion of this monitoring, a progressive pretreatment program has been established that should mitigate toxic discharges. Therefore, this monitoring data was not used in this assessment.

The USDA is coordinating two projects: one in West Maricopa Hydrologic Unit Area and the other in the Casa Grande-Coolidge area. The purpose is to evaluate the impact of agricultural practices on groundwater quality and to assist local agricultural clientele with implementation of Best Management Practices to minimize potential for groundwater degradation. These projects are a cooperative effort between the Soil Conservation Service, Agricultural Stabilization and Conservation Service, Cooperative Extension Service, Arizona Department of Water Resources, Natural Resource Conservation Districts, and local producers.

In the Queen Creek and Eloy areas (New Magma and Central Arizona Irrigation and Drainage Districts), the Soil Conservation Service is providing accelerated technical and financial assistance to improve on-farm chemical handling facilities and irrigation systems which reduce deep percolation and runoff. The Soil Conservation Service is cooperating on this project with Natural Resource Conservation Districts, local Irrigation and Drainage Districts, and ADWR in implementing land treatment projects to address water quality and quantity concerns. A similar land treatment project is in the planning stage for the Hohokam Irrigation District.



Map 18. Middle Gila River Basin

ADEQ - 1994 (Scale 1 inch = 25 miles)

Table 22. Middle Gila River Basin 1994 Assessment Statistics

STREAMS		LAKES	
Total Miles Assessed (72 reaches)	1,006	Total Acres Assessed (7 lakes)	1,841
Full Support	171	Full Support	14
Threatened	189	Threatened	62
Partial Support	260	Partial Support	1,565
Non-support	386	Non-support	200
Top Stressors/Causes	(miles impacted)	Top Stressors/Causes	(acres impacted)
Metals	465	Metals	1,541
Salinity/TDS	214	Pesticides	200
Turbidity	212	Salinity/TDS	200
Suspended solids	165	Dissolved oxygen	200
Pathogens	135	Other habitat alterations	200
Dissolved oxygen	126		
Pesticides	118		
Top Sources	(miles impacted)	Top Sources	(acres impacted)
Agricultural activities	430	Agricultural activities	1,740
Natural	300	Natural	1,541
Hydromodification	272	Hydromodification	255
Major/Minor municipal	237	Major/Minor industrial	200
Landfills	124	Major/Minor municipal	200
Urban runoff	112	Landfills	200
Resource extraction	92		
Major/Minor industrial	99		
Stream Miles in Basin	Total: 14,164	Lake Acres in Basin	Total: 63,253
Perennial	206	Perennial	60,203
Non-perennial	13,958	Non-perennial	3,050
On Indian Lands	911	On Indian Lands	725
Not Indian Lands	13,253	Not Indian Lands	62,528

Miles and acres have been rounded to nearest whole number.
TDS = total dissolved solids.

Table 23. Middle Gila River Basin Assessments

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15050100-010 Gila River, San Carlos Res.-Dripping	16	E	N		Partial	Evaluation based on upstream and downstream monitoring (AZ15050100-008) and (AZ15040005-011). NPDES permit at Coolidge dam: full compliance.
AZ15050100-009 Gila River, Dripping Spr-San Pedro	11	E	N		Non	Evaluation based on upstream and downstream monitoring (AZ15050100-008) and (AZ15040005-011 in Upper Gila River Basin). NPDES permit for AZ Dept of Correction Eyman facility: non-support due to ammonia, nitrogen, mercury, copper, silver, cadmium, and lead.
AZ15050100-008 Gila River, San Pedro-Mineral Cr	18	E	Y		Non	ADEQ Ray Mine Investigation 1990, 3 sites: non-support A&Ww, FBC due to copper, and turbidity; partial support AgI, FC due to arsenic and TDS. USGS station 1989,1 sample: partial support A&Ww, FBC, due to turbidity. 2 NPDES permits: 1) Winkleman POTW: non-support A&Ww due to phosphate, 2) Kearny POTW: full support.
AZ15050100-007 Gila River, Mineral Cr-Donnelly W	14	E	Y		Non	ADEQ (Ray Mine Inv.) 1990, 4 samples: non-support A&Ww, FBC, and AgL due to copper and turbidity, partial support FC, A&Ww, and AgI due to TDS, arsenic, and copper. Evaluation of persistence based on upstream monitoring (AZ15050100-008).
AZ15050100-005 Gila River, Donnelly W-Box O Wash	2	E	N		Non	Evaluation based on upstream monitoring (AZ15050100-007) and (AZ15050100-008).
AZ15050100-003 Gila River, Box O Wash-Queen Creek	50	E	N		90% Part 10% Non	ADEQ (Ray Mine Inv.) 1990, 1 sample: partial support FC due to arsenic. 2 NPDES permits: AZ Sierra WTP and Florence POTW: non-support due to ammonia, chlorine, mercury, and sulfide. Reach has 4 sets of designated uses: Box-O Wash to Ashurst-Hayden Dam (2.3 miles A&Ww, FBC, FC, AgI, AgL); Ashurst-Hayden Dam to Florence POTW (2.4 miles-drop AgI); Florence POTW to Feliz Rd (approx 5 miles A&Wedw, PBC, AgL); below EDW to Queen Creek (44.8 miles A&Ww, PBC, AgL). Evaluation of turbidity and sedimentation problems based on upstream sampling (AZ15050100-007).
AZ15050100-001 Gila River, Santa Cruz Wash-Salt	13				N.A.	Indian Lands: not assessed. ADEQ (upstream of Salt), 11 samples: would be non-support due to DO, turbidity. (Boron 1460-1860 mg/l, Se, SO3, and TDS high.) See AZ15070101-003.
AZ15070101-015 Gila River, Salt River-Aqua Fria River	4	M	Y		Non	ADEQ fixed station 1990-91, 14 samples: partial support FC due to mercury. Threat of FC due to arsenic and beryllium exceeding standards once (in other samples lab detection level too high). FWS/ADEQ monitoring 1980-1990 indicated fish and turtle contamination by DDT metabolites and toxaphene; sediment contamination by DDT metabolites. 1992 and 1993 spring flood erosion of the Tri-City Landfill resulted in debris in water and along stream banks (narrative violations).

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15070101-014 Gila River, Agua Fria-Waterman	12	E	Y		Non	Evaluation based on upstream and downstream monitoring (AZ15070101-007) and (AZ15070101-015). Erosion of the Tri-City Landfill resulted in debris in water and deposited on stream bank. (Still cleaning up)
AZ15070101-010 Gila River, Waterman W-Hassayampa	12	E	Y		Non	Evaluation based on upstream and downstream monitoring (AZ15070101-007) and (AZ15070101-015). ADEQ Clean Lakes Program 1992, 1 deep sediment boring indicated sediment contamination with DDT metabolite below detection limit. Buckeye POTW: non-support due to boron, arsenic, mercury, copper and silver.
AZ15070101-009 Gila River, Hassayampa-15070101-016	1	E	Y		Non	Evaluation based on upstream and downstream monitoring (AZ15070101-007) and (AZ15070101-015). ADEQ Clean Lakes Program 1992, deep sediment borings did not indicate sediment contamination.
AZ15070101-008 Gila River, 15070101-016-Centennial W	10	E	Y		Non	ADEQ Clean Lakes Program 1 sediment deep boring detected DDT metabolites contamination. Evaluation based on fish and turtle contamination and downstream water monitoring (AZ15070101-007). Erosion of Tri-City Landfill resulted in floating material and debris deposits on stream bank.
AZ15070101-007 Gila River, Centennial -15070101-006	6	M	Y		Non	USGS station at Gillespie Dam 1989-93, 60 samples: Non-support A&Wedw due to Fecal coliform. Partial support FC, AgI, A&Wedw, AgI due to arsenic, boron, TDS, and turbidity. FWS/ADEQ monitoring water, fish, and sediment 1980-1990 revealed fish & turtle contamination by DDT metabolites and toxaphene in the Gila River between the Salt River and Painted Rocks Lake (Borrow Pit). DDT metabolites were also detected in the sediment. ADEQ Clean Lakes program sediment borings in 1992 indicated DDT metabolites contamination. Fish advisory in place since 1991 ADHS risk assessment. Erosion of Tri-City Landfill (located in Salt River floodplain) debris coated banks and filled stream with debris during 1993 floods.
AZ15070101-005 Gila River, (15070101-006)-Sand Tank	14	E	Y		Non	ADEQ Clean Lakes Program sediment deep borings did not detect contamination of pesticides or metals. Evaluation based on fish and turtle contamination and upstream water monitoring (AZ15070101-007). NPDES for Luke Air Force Base in Gila Bend: full support.
AZ15070101-003 Gila River, Sand Tank Wash-Sauceda Wash	5	E	N		Non	Evaluation based on upstream and downstream monitoring (AZ15070101-001) and (AZ15070101-007). Gila Bend POTW was several feet under water when Painted Rock Reservoir backed up during the 1993 floods. Gila Bend POTW: threat to A&Ww due to excess suspended solids.

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15070101-001 Gila River, Sauceda Wash-Painted Rock	19	M	Y		Non	FWS/ADEQ monitoring water, fish, and sediment 1980-1990 revealed fish & turtle contamination by DDT metabolites and toxaphene in the Gila River between the Salt River and Painted Rocks Lake (Borrow Pit). DDT metabolites were also detected in the sediment. ADEQ Clean Lakes program sediment borings in 1992 indicated DDT metabolites contamination at or below detection limit. Upstream water monitoring revealed impairment (see AZ 15070101-007). Fish ban in place since 1991 ADHS risk assessment due to DDT metabolites, toxaphene, chlordane, dieldrin, and mercury. The 1993 inundation of Tri-City Landfill with flood waters left debris coating banks and filled stream with debris (much debris still present). Evaluation also based on upstream monitoring at Gillespie Dam (AZ15070101-007).
AZ15050100-012 Mineral Creek, hdwt-Gila River	17	M	Y		Non	ADEQ complaint investigation (WQMS 212.251) 1992, 9 sites water samples and 1 sediment: non-support of A&Ww due to copper and sulfide. ADEQ investigations of 2 mines (Ray Mine and Gibson Mine) 1990-1992: non-support A&Ww, FBC, AgL due to copper, zinc, and pH (low); threat support of FC due to arsenic and beryllium. ADEQ fixed station 1993, 11 samples: non-support A&Ww due to copper. EPA sample (Copper Mines Initiative) on tributary in 1992: partial support FC and FBC due to beryllium. ADEQ priority pollutant monitoring of fish and sediment: arsenic and beryllium above Health Based Guidance Levels (ADHS, 1992) for human ingestion of sediment.
AZ15050100-011 Dripping Spring Wash, hdwt-Gila River	17		N		N.A.	Insufficient data to assess stream. NPDES permit Cyprus/Miami Mine at Christmas: full compliance.
AZ15050100-010OFF9 Mescal Creek	9	E	N		Partial	BLM monitoring 1990-93, 3 samples: partial support of FBC, A&Ww, AgI, AgL due to fecal coliform.
AZ15050100-014 Queen Creek, hdwt-Witlow Canyon	17	E	N		Non	3 NPDES permits. Magma Superior and Superior Sanitary Dist: full compliance. Queen Valley Sanitary Dist.: non-support due to chlorine, fecal coliform, suspended solids, and settlable solids.
AZ15050100-013 Queen Creek, Witlow Canyon-Gila R	43	E	N		Threat	ADEQ investigation 1993, 2 sites: full support. 3 NPDES permits: Mining Camp Restaurant and Roadhaven R.V. Park in full compliance; Williams Air Force Base on tributary non-support due to zinc, mercury and bioassay.
AZ15050100-000 Weekes Wash	12	E	N		Full	ADEQ priority pollutant monitoring 1992 fish and sediment: no exceedance of Health Based Guidance Level (ADHS, 1992) or EPA fish criteria.

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15060106-001 Salt River, Granite Reef-Gila River	42	M	Y		Non	This reach flows through the Phoenix metro area. ADEQ monitoring station 1990-91, 14 samples: non-support A&Wedw due to mercury, partial support A&Wedw, PBC, AgL due to pH. Tri-City Landfill eroded into Salt River in two episodes: non-support of all uses (narrative standards). NPDES permits in compliance: Phoenix 23rd Ave, Tempe POTW's, and W. Cotton Service Co. NPDES permits impairing water: AMERON Inc (settlable solids), Phoenix 91st Ave (chlorine, fecal coliform, suspended solids), Tolleson (chlorine, suspended solids, BOD), and Union Rock and Material (dichloroethene). USFWS fish, turtle, and sediment monitoring (1980-1990) indicates serious contamination by DDT metabolites and toxaphene. Fish advisory/ban below 59th Ave due to DDT, toxaphene, chlordane, dieldrin, and mercury.
AZ15060106-001OFF42 Arizona Canal, Granite Reef Dam-Skunk	40	E	N		Threat	SRP monitoring 1990-92, 20 samples: TDS threat to DWS. ADEQ priority pollutant monitoring 1992 (fish and sediment): no criteria were exceeded.
AZ15060106-001OFF Grand Canal, Crosscut Cnl-New River	24	E	N		Full	SRP monitoring at lateral 23: full support.
AZ15060106-001OFF Southern Canal, Granite Reef Dam-Consolidated	7	E	N		Partial	SRP monitoring 1990-92, 20 samples: mean of TDS exceeds secondary drinking water standard - partial support DWS.
AZ15060106-0010FF Consolidated Canal, Southern-Superstition	22	E	N		Partial	SRP monitoring 1990-91, 8 samples (few parameters): DWS partial support due to chloride and TDS exceeding secondary drinking water standards.
AZ15060106-001OFF Tempe Canal, Consolidated-Western	9	E	N		Partial	ADEQ 1993 priority pollutant monitoring of fish and sediment: beryllium contamination of sediment over Health Based Guidance Level (ADHS, 1992). SRP monitoring 1990-92, 16 samples: TDS exceeds secondary drinking water standards.
AZ15060106-001OFF Western Canal, Tempe Canal-43rd Ave, Phx	14	E	N		Full	SRP monitoring 1990-92, 20 samples: full support.
AZ15060106-001OFF Eastern Canal, Southern Cnl-Superstition	20	M	N		Full	SRP monitoring 1990-92, 20 samples: full support.

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15060106-001TD Tempe Drain, hdwt-Salt River	3	E	N		Full	ADEQ priority pollutant monitoring 1993 (fish and sediment): beryllium over Health Based Guidance Level (ADHS, 1992) in sediment. ADEQ complaint investigation 1989: mercury would exceed FC level (not a protected use in drain, but sample taken as it entered Salt River).
AZ15060106-026 Cave Creek, hdwt-Arizona Canal	70	E	N		Threat	ADEQ fixed station 1992-93, 6 samples: full support. USFS/ADEQ cooperative monitoring 1991, 3 samples: full support. ADEQ/Kleinfelder 304(l) investigation @ Maricopa Mine: sediment contamination by lead and zinc. This contamination threatens A&Ww, AgI, AgL uses. Spur Cross Ranch NPDES permit: full compliance.
AZ15070102-032 Agua Fria River, hdwt-Lynx Creek	13	E	N		Full	Evaluation based on downstream monitoring (AZ15070102-023).
AZ15070102-031 Agua Fria River, Lynx Creek-Yarber Wash	16	E	N		Partial	Evaluation based on upstream and downstream monitoring. NPDES permits in full compliance: Soft Winds Mobile Home Park & Magma Copper McCabe Mine.
AZ15070102-029 Agua Fria River, Yarber Wash-Ash Creek	5	E	N		Partial	Evaluation based on downstream monitoring (AZ15070102-19) and (AZ15070101-023) and upstream on Lynx Creek (AZ15070102-033).
AZ15070102-025 Agua Fria River, Ash Creek-Sycamore Cr	1	E	N		Partial	Evaluation based on downstream monitoring (AZ15070102-023) and upstream (AZ15070102-033).
AZ15070102-023 Agua Fria River, Sycamore Creek-Big Bug Creek	10	E	N		Partial	BLM monitoring 1993, 1 sample: partial support FBC, A&Ww, DWS, AgI, AgL due to fecal coliform source probably open range grazing. ADEQ biocriteria site (phys/chem monitoring) 1 sample: full support. Evaluation of partial support FC due to arsenic based on upstream and downstream monitoring (lab detection levels at these sites 3 times the standard).
AZ15070102-022 Agua Fria River, Big Bug Creek-Squaw Cr	11	E	N		Partial	Evaluation based on upstream monitoring (AZ15070101-023) and in tributaries.
AZ15070102-020 Agua Fria River, Squaw Ck.-Black Canyon	3	M	N		Partial	Evaluation based on downstream monitoring (AZ15070102-019).

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15070102-019 Agua Fria River, Blk Cyn.Ck.-Little Squaw	4	M	Y		Partial	USGS station at Rock Springs 1989-92, 48 samples: Partial support FC and A&Ww due to arsenic and low DO; threats to FBC and A&Ww due to fecal coliform and turbidity (violations occur consistently in August during monsoon rain flows). ADEQ special investigations in 1990 indicate partial support FC due to arsenic. BLM monitoring 1993, 1 sample: partial support FBC, A&Ww, AgI, AgL due to fecal coliform.
AZ15070102-017 Agua Fria River, Ltl Squaw Ck-Cottonwood	6	E	N		Partial	Evaluation based on upstream and downstream monitoring (AZ15070101-007) and (AZ15070102-019).
AZ15070102-016 Agua Fria River, Cottonwood Ck-Humbug	6	E	N		Partial	Evaluation based on upstream and downstream monitoring (AZ15070101-007) and (AZ15070102-019).
AZ15070102-015 Agua Fria River, Lake Pleasant-Humbug Cr	1	E	N		Partial	Evaluation based on upstream and downstream monitoring (AZ15070101-007) and (AZ15070102-019).
AZ15070102-014 Agua Fria River, Humbug Cr-Lake Pleasant	1	E	N		Partial	Evaluation based on upstream and downstream monitoring (AZ15070102-019) and (AZ15070102-008).
AZ15070102-008 Aqua Fria River, Lake Pleasant-Beardsly Canal	5	M	Y		Threat	USGS station 1989-92, 15 samples: partial support FC due to arsenic. USBR New Wadell Dam NPDES permit: full compliance.
AZ15070102-007 Aqua Fria River, Beardsly Canal-New River	20	E	N		Partial	Evaluation based on upstream monitoring (AZ15070102-008). Luke Air Force Base NPDES discharge on unnamed tributary: threat to this reach due to ammonia, chlorine, mercury, boron sulfide, selenium and zinc exceedances of permit levels. ADEQ priority pollutant monitoring of fish and sediments: arsenic and beryllium exceeded HBGLs for human ingestion of sediment.
AZ15070102-001 Agua Fria River, New River-Gila River	8	E	N		Non	Evaluation based on upstream monitoring (AZ15070102-008). Avondale POTW: nonsupport due to nitrogen and several phenols. Loral Corporation (on Buckeye Canal): nonsupport due to bromoform, tetrachloroethene, dichloroethan, trichloroethane, grease/oil, and copper. Goodyear POTW: partial support due to settable solids and fecal coliform.
AZ15070102-034 Big Bug Creek, hdwt-Aqua Fria River	27	E	N		Partial	BLM monitoring 1993, 1 bacteria sample: partial support FBC, A&Ww, AgI, AgL (open range grazing believed the source).

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15070102-033 Lynx Creek, hdwt-Agua Fria River	15	E	N		Threat	ADEQ priority pollutant monitoring (fish and sediment): sediment contamination with arsenic, lead, and beryllium exceeding HBGLs (ADHS, 1992). USFS/ADEQ monitoring 1991, 2 samples: full support. Prescott Natl. Forest abandoned mine survey 1990, 5 sites: full support. ADEQ complaint investigation (water and soil): full compliance (arsenic would be high for fish consumption). 3 of 4 NPDES permits in full compliance. Only Villages at Lynx Creek in non-support A&Ww due to excess chlorine.
AZ15070102-033OFF Knapp Gulch, hdwt-Lynx Creek	2	E	N		Threat	Prescott National Forest abandoned mines survey 1990: full support.
AZ15070102-031OFF Galena Gulch, hdwt-Agua Fria River	6	M	Y		Non	Magma Copper Co monitoring (Hargis & Assoc) 1990-93: sediments contaminated with chromium, lead and zinc (lead exceeds ADHS's Health Based Guidance Level for consumption). Water samples in cistern and below tailings ponds indicate non-support of A&Ww and AgL due to lead and cyanide.
AZ15070102-028 Ash Creek, hdwt-Yellow Jacket	25	E	N		Partial	ADEQ biocriteria site (phys/chem monitoring) 1992, 1 sample: full support. BLM monitoring 1993, 1 sample 1993: partial support FBC due to fecal coliform believed caused by open range grazing.
AZ15070102-026OFF Little Ash Creek, hdwt-Ash Creek	15	E	N		Partial	ADEQ biocriteria site (phys/chem monitoring) 1992-93, 2 samples: partial support A&Ww due to low dissolved oxygen.
AZ15070102-024 Sycamore Creek, hdwt-Agua Fria River	16	E	N		Full	ADEQ biocriteria site (phys/chem monitoring) 1992-93, 2 samples: full support.
AZ15070102-022OFF Lousy Canyon, hdwt-Agua Fria	5	E	N		Partial	BLM monitoring 1993, 1 sample: partial support FBC due to fecal coliform (probable source: open range grazing).
AZ15070102-022OFF Silver Creek, hdwt-Agua Fria	14	E	N		Full	BLM monitoring 1993, 1 sample: full support.
AZ15070102-022OFF Indian Creek, hdwt-Agua Fria	12	E	N		Partial	BLM monitoring 1993, 2 samples: partial support A&Ww, FBC, AgI, AgL and DWS due to fecal coliform (probable source: open range grazing).
AZ15070102-035 Black Canyon Ck., hdwt-Aqua Fria River	15	E	N		Full	ADEQ station BCC1 1993, 2 samples: full support. BLM monitoring 1993, 1 sample (bacteria only): no exceedance.

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15070102-035OFF Dripping Spring, hdwt-Black Canyon	3	E	N		Full	BLM monitoring 1993, 1 sample: full support.
AZ15070102-035OFF Rock Springs Creek, hdwt-Black Canyon	3	E	N		Partial	ADEQ complaint investigation (WQMS 212.283) 1993, 2 samples: partial support of PBC and AgL due to arsenic (FC not a use here).
AZ15070102-037 Poland Creek, hdwt-Black Canyon	8	E	N		Partial	ADEQ biocriteria site (phys/chem monitoring) 1992, 1 sample: full support. USFS/ADEQ cooperative monitoring 1991, 2 samples: full support. USFS Crown King facility in Prescott Natl Forest: partial support due to chlorine (facility closed due to continued violations during this period).
AZ15070102-036 Turkey Creek, hdwt-Poland Creek	18	E	Y		Non	Prescott National Forest/Labat-Anderson 1990 monitoring 3 sites (total of 7 samples): non-support FBC, AgI, AgL, and A&Ww due to arsenic, cadmium, copper, cyanide, lead and zinc; partial support of FBC due to antimony. USFS/ADEQ monitoring 1991, 3 samples: full support.
AZ15070102-016OFF Tule Creek, hdwt-Agua Fria	8	E	N		Full	BLM monitoring 1993, 1 sample: full support. ADEQ biocriteria site (phys/chem monitoring) 1 sample: partial support FC due to arsenic.
AZ15070102-042OFF Ad Wash, hdwt-Castle Creek	2	E	N		Full	BLM monitoring 1993, 1 sample: full support.
AZ15070102-006 New River, hdwt-Deadman Wash	34				N.A.	Not enough information to assess. USBR New River Dam NPDES permit: full compliance.
AZ15070102-002 New River, Skunk Wash-Aqua Fria	12	E	N		Threat	ADEQ hazardous materials investigation in 1991 of auto shredder materials: soil contamination with cadmium and lead.

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15070103-007 Hassayampa River, hdwt-Blind Indian Ck.	25	E	Y		Non	ADEQ fixed stations above and below Senator Mine: full support above (although threatened by metals and turbidity) and non-support of uses below due to cadmium, copper pH, zinc, and turbidity; partial support due to lead. ADEQ biocriteria site (phys/chem monitoring) and USFS site, 5 samples: full support. ADEQ priority pollutant sediment sample: arsenic, antimony, beryllium, cadmium, lead, and zinc exceed HBGL for human ingestion of sediments below Senator Mine. ADEQ monitoring in 1990 on unnamed wash to McCleur Mine also indicates non-support due to heavy metals, low DO, and low pH. ADEQ investigation Senator Mine 1993, 2 sites sampled twice: non-support of most uses due to pH, Zinc, Copper and cadmium; sediment samples: lead and aluminum exceed Health Based Guidance Levels (ADHS, 1992). ADEQ investigation of Cash Mine on unnamed tributary 1990-1993, 3 samples: non-support AgL, A&Ww, FBC due to cadmium, copper, pH, and zinc.
AZ15070103-005 Hassayampa River, Blind Indian-Cottonwood	1	E	N		Threat	Evaluation based on upstream monitoring (AZ15070103-007).
AZ15070103-004 Hassayampa River, Cottonwood Cr-Martinez	26	M	Y		Partial	ADEQ station 1990-93, 23 samples: partial support FBC and A&Ww due to turbidity (suspended solids). ADEQ WQARF investigation of Wickenburg Mill 1991 set of 2 samples: full support.
AZ15070103-003 Hassayampa River, Martinez Wash-Sols Wash	1	E	Y		Non	ADEQ investigation of Vulture Mill (WQMS 212.236) 1992, 6 sites: non-support A&Ww, FBC, AgI, AgI due to ammonia, boron, cadmium, copper, lead, manganese, mercury, pH (high), selenium; partial support due to turbidity.
AZ15070103-002 Hassayampa River, Sols Wash-Jackrabbit	40	M	Y		Non	ADEQ station 1990-91, 10 samples: A&Ww non-support due to low dissolved oxygen; threat to FBC & A&Ww due to turbidity. ADEQ biocriteria site (phys/chem monitoring) 1992-93, 2 samples: full support. ADEQ priority pollutants fish and sediment: ok. 2 NPDES permits, both full compliance.
AZ15070103-001 Hassayampa River, Jackrabbit-Gila River	15	E	Y		Non	ADEQ Clean Lakes 1992 deep sediment borings: DDT metabolites present. Monitoring of fish and sediments 1980-1990 by FWS (and others) indicated fish and soft shelled turtles contaminated by DDT and toxaphene (at levels that should interfere with reproduction in some species), sediment contaminated by DDT metabolites. Fish ban since 1991 due to chlordane, dieldrin, ddt metabolites, toxaphene, and mercury.
AZ15070103-010 Antelope Creek, Dd-Martinez Creek	17	E	N		Full	ADEQ biocriteria site (phys/chem monitoring) 1992-93, 2 samples: full support.

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZ15070103-007OFF French Gulch, hdwt-Hassayampa	9	M	Y		Non	ADEQ Zonia Mine investigations (WQMS 212.068) monitoring 1989-93, 22 samples: non-support all uses due to beryllium, cadmium, copper, manganese, mercury, low pH, zinc, and TDS. ADEQ priority pollutant program 1993 sediment sample: arsenic and beryllium exceeded HBGLs for human ingestion of sediment.
AZL15060106-0050 Alvord Park Lake	25	E	N	E	Partial	Priority pollutant sediment monitoring 1992: arsenic and beryllium exceeded HBGLs for sediment consumption. AGFD monitoring 1988-92, 3 samples: A&Ww partial support due to turbidity.
AZL15060106-0300 Chaparral Park Lake	11		N		N.A.	Not assessed for water chemistry. ADEQ priority pollutant monitoring 1992 fish and sediment: arsenic and beryllium exceeded HBGL for sediment ingestion.
AZL15070103-3160 Hassayampa Lake	1	E	N		Threat	ADEQ Priority Pollutant monitoring 1993 fish and sediment: arsenic, beryllium, and lead exceeding HBGL (ADHS) for sediment ingestion by humans.
AZL15060106-0740 Kiwanis Park Lake	14	E	N	M	Full	ADEQ priority pollutant program 1992 fish and sediment: arsenic exceeded HBGL for sediment consumption. AGFD (limited data) 1989-91: full support.
AZL15070102-0860 Lynx Lake	55	E	N	M	Threat	ADEQ Clean Lakes Program 1992, 6 samples: full support. ADEQ Priority Pollutant Program 1992 sediment and 1993 sediment & fish: arsenic, lead, and beryllium above Health Based Guidance Levels (ADHS, 1992) for ingestion of soil.
AZL15060106-0920 McKellips Park Lake	6	E	N		Threat	McKellips Park Lake. ADEQ Priority Pollutant Program 1992 sediment samples: arsenic and beryllium exceeded HBGLs (ADHS, 1992) for human ingestion of sediment. AGFD monitoring 1992 (limited parameters): full support.

Table 23. continued (Middle Gila River Basin)

WATERBODY ID, NAME, LOCATION	MILES OR ACRES*	EVALUATED OR MONITORED	WATER QUALITY LIMITED	TROPHIC STATUS	USE SUPPORT	BASIS OF ASSESSMENT
AZL15070101-1020 Painted Rock Reservoir	200	M	Y		Non	ADEQ Clean Lakes Diagnostic/Feasibility Study 1993 concluded that reservoir sediments contain low levels of DDE and metals when compared to Health Based Guidance Levels for ingestion of sediments. But prior fish and turtle tissue analysis (FWS studies in 1980s) indicated bioconcentration of DDE and toxaphene at levels of concern for wildlife. ADHS Health Risk Assessment for Painted Rocks and Gila River 1991 resulted in a fish ban and a warning that there was a cancer risk associated with fish consumption. Monitoring by Corps of Engineers and USFWS 1992-93 18 samples: partial support A&Ww due to low DO (no metals or organics tested). Evaluation of water quality based on upstream and downstream monitoring (AZ15070201-1010) and (AZ15070101-007). Erosion of Tri-City Landfill in January 1992 and 1993 floods resulted in non-support due to narrative violations (debris in water and accumulating on stream banks).
AZL15070102-1100 Pleasant, Lake	1540	E	N	M	Partial	ADEQ Clean Lakes Program 1992, 2 samples: FC partial support due to arsenic. USFWS Bald Eagle Prey Study (King et al., 1993): fish contaminated above EPA levels of concern for mercury. ADEQ Priority Pollutant Program 1992 fish and sediment: no exceedance of criteria. USGS station at Lake Pleasant 1991, 1 sample: partial support FC due to arsenic.

Notes: Water Quality Limited Waterbodies are included on the Clean Water Act 303(d) list and prioritized for completion of Total Maximum Daily Load analyses.
Trophic status of lakes include: Oligotrophic (O) = nutrient poor, biologically unproductive; Mesotrophic (M) = intermediate nutrient availability and biological productivity; and Eutrophic (E) = nutrient rich, highly productive; Hypereutrophic (H) = pea-soup conditions, the extreme end of the eutrophic stage.
Miles and acres rounded to nearest full number.
Monitored or Evaluated = type of assessment based on amount of data available.

ILLINOIS RIVER BASIN

The Illinois River Basin is the most significant waterway in the state. The basin covers a total of 29,010 square miles, 24,810 of which are in Illinois and the remainder in Indiana and Wisconsin. It reaches from Lake Michigan to its confluence with the Mississippi River near Grafton, Illinois (Figure 14). The Illinois River is formed by the confluence of the Des Plaines and Kankakee rivers and is divided into eight navigation pools by a series of locks and dams. Major streams which comprise the Illinois River Basin include the Des Plaines River, Kankakee River, Illinois River, Aux Sable River, Mazon River, Fox River, Vermilion River, Bureau Creek, Mackinaw River, Spoon River, Sangamon River, LaMoine River, McKee Creek, Mauvaise Terre Creek, Apple Creek, Macoupin Creek along with numerous smaller tributaries. Four of these streams, the Des Plaines, Kankakee, Fox and Sangamon Rivers are discussed as separate basins within this report.

A total of 2,886.9 stream miles in the Illinois River basin were assessed for overall use support (Table 26). Assessments were based on both evaluated, 953.8 stream miles (33.0%), and monitored, 1,933.1 stream miles (67.0%). Since overall use support assessments were based on aquatic life use, (Table 26) the results are discussed collectively. Overall use was rated as full support on 1,635.3 stream miles (56.0%). Another 15.6 stream miles (0.5%) were rated as threatened. Partial support with minor impairment occurred on 1,156.9 stream miles (40.1%) and 79.1 stream miles (2.7%) were rated as partial support with moderate impairment. Table27 summarizes the causes and sources of less than full support.

The fish consumption use was assessed on 488.3 stream miles in the Illinois River basin (Table 26). Of these, 368.6 stream miles (75.5%) were rated as full use support. The remaining 119.7 stream miles (24.5%) were not supporting the fish consumption use due to advisories (Chapter 4). Of the 413.3 stream miles assessed for swimming, 117.3 (28.4%) were rated as full use support (Table 26). Partial support with moderate impairment occurred on 46.2 stream miles (11.2%). The remaining 249.8 miles were not supporting the swimming use. The swimming use did not apply to 570.1 stream miles due to disinfection exemptions. Drinking water use (PWS = public water supply) was present on 95.8 stream miles in the Illinois River basin (Table 26). Of these, 41.4 stream miles (43.2%) were rated as full use support. Partial support with minor impairment occurred on 31.8 stream miles and partial support with moderate impairment was present on 22.6 stream miles (23.6%). The drinking water use was not applicable to 98.8 percent of the basin.

Illinois River

The Agency conducted an intensive survey of the Illinois River from Lockport (river mile 292.0) to Pekin (river mile 153.0) in 1989-1990. Data on water quality conditions were obtained at 19 mainstem stations and at seven major tributary stations. Water samples were collected once a month from April to October for temperature, pH, dissolved oxygen, specific conductance, nutrients, phenols, cyanide and metals. Water samples for organochlorine pesticide and PCB analysis were collected in May and October. Sediment samples were collected once at each station for nutrients, metals and organochlorine compounds. Macroinvertebrate samples were collected at all stations in May/June and August using Hester Dendy artificial substrates (four-week exposure period) or by hand-picking (tributaries). These data collection efforts were part of an interagency monitoring study of the Upper Illinois River. Other monitoring activities were conducted by MWRDGC, Illinois Natural History Survey, Illinois State Water Survey and Illinois Department of Conservation. Assessment of the Illinois River was based on water quality, macroinvertebrate and sediment data (Appendix Table A-5).

Big Bureau Creek

Big Bureau Creek, located in north central Illinois, drains approximately 486 square miles before emptying into the Illinois River near Bureau, Illinois. A total of 124.9 stream miles were assessed during a 1990 intensive survey. Of the total, 97.5 miles (78.1%) were rated as full support. East Bureau Creek, 27.4 miles, and 9.5 miles of Big Bureau Creek were rated as partial support/minor impairment, mainly due to elevated nutrient concentrations attributed to nonpoint agricultural sources.

Vermilion River

The Vermilion River (one of two in the state) is located in north central Illinois and drains approximately 1,331 square miles in portions of Ford, LaSalle, Livingston and Woodford counties. The river, which is approximately 76 miles long finally empties into the Illinois River near Oglesby. The Vermilion flows in a northeasterly direction and is formed by the confluence of its primary tributaries, the North and South Fork, which drain 324 and 187 square miles respectively. There are five small dams on the mainstem. Three of these dams are less than seven feet in height and serve as a water supply for the city of Pontiac. The Streator dam is the highest at 30 feet and also provides drinking water. The last dam is located at Oglesby and has been partially breached over the years. Two AWQMN stations are located near Pontiac and Leonore.

A total of 66 river miles were assessed on the Vermilion River. Of these, 45.5 miles were rated as fully supporting uses. The remaining 25.5 miles were rated partial support with minor impairment. Impaired reaches were limited to the water below Pontiac, and above the supply dams at Streator and Pontiac. Causes of impairment included dissolved oxygen, siltation and suspended solids. Sources of impairment were primarily flow modifications, channelization and nonpoint runoff.

A total of 277.6 miles were assessed on fifteen tributaries to the Vermilion River. The majority of tributaries, 239.2 miles, were rated as fully supporting aquatic life uses. The remaining 38.4 miles were rated as partially supporting designated aquatic life uses. This included segments of Baker Creek, North Fork Vermilion River, Kelly Creek and Murray Ditch. The primary causes of impairment were siltation and total suspended solids due to channelization and nonpoint runoff.

The Vermilion River basin supports a small population of the greater redhorse (Moxostoma valenciennesi) which was thought to have been extirpated from Illinois and the river redhorse (Moxostoma carinatum) a state endangered species.

Mazon River

The Mazon River is located in northeastern Illinois and drains approximately 524 square miles primarily in Grundy County before its confluence with the Illinois River near Morris. Seven stations were sampled for an intensive basin survey in 1993. At the time of this report, not all data has been analyzed. All of the 89.3 stream miles in the basin were rated as full use support.

Mackinaw River

The Mackinaw River drains approximately 1,136 square miles in portions of three central Illinois counties. The river flows in a westerly direction and empties into the Illinois River south of Pekin, Illinois. Land use is predominately agricultural and the largest city in the drainage is Morton.

A total of 308.8 stream miles were assessed on the Mackinaw and its tributaries. A full use support rating was attained on 244.4 (79.1%) stream miles. These streams support a normally diverse fish and macroinvertebrate community, even though some exhibit minor water quality problems due to nutrients and turbidity.

Partial support/minor impairment occurred on 40.9 stream miles and included the lower portions of the Mackinaw River and Mud Creek. Partial support/moderate impairment occurred on 23.5 stream miles on Prairie and Indian Creeks. The primary causes of less than full use support were elevated turbidity and nutrient concentrations attributable to nonpoint agricultural sources and municipal point source discharges. Channelization on the lower Mackinaw River and Indian Creek also impacted use on these streams.

Spoon River

The Spoon River is located in west central Illinois and drains approximately 1,855 square miles before flowing into the Illinois River north of Havana, Illinois. The Spoon River, 123.7 stream miles, was rated as partial support/minor impairment. The primary cause was elevated turbidity, and to a lesser degree, nutrients attributable to nonpoint agricultural sources and coal mining in the region. The West Fork Spoon River was rated as partial support/moderate impairment due to nutrients and organic enrichment attributable to a municipal point source discharge.

LaMoine River

The LaMoine River is located in west central Illinois and flows into the Illinois River south of Beardstown, Illinois. The LaMoine River is 95.9 miles long and drains approximately 1,350 square miles. Land use in the region is predominately cropland (59.9%) with corn and soybeans the dominant crops. The region leads Illinois in the production of beef cattle and has substantial acreage (15.6%) devoted to pasture. Strip coal mining activities and urban areas (Macomb, pop. 20,628) also influenced surface water in the LaMoine River basin.

A total of 423.7 stream miles were assessed in the LaMoine River basin. Of the total, 299 stream miles (69%) were rated full use support. This included the lower three fourths of the LaMoine River basin. Approximately 128 stream miles (30%) were rated partial support/minor impairments in the upper LaMoine River and in a number of major tributaries. A 5.9 mile reach of the South Branch LaMoine River was rated as partial support/moderate impairment. The primary causes of impairment were turbidity attributed to nonpoint agricultural, mining, and organic enrichment from point source municipal discharges.

Macoupin Creek

Macoupin Creek is located in southwest central Illinois and drains approximately 961 square miles before flowing into the Illinois River near Hardin, Illinois. Of the 135.8 stream miles in the Macoupin Creek basin, 11 miles (8.0%) were rated as full support, and 124.8 (92.0%) were rated as partial support/minor impairment. This was due primarily to elevated nutrients and sedimentation.

Apple Creek

Apple Creek is located in southwest central Illinois and drains approximately 405 square miles before flowing into the Illinois River near Eldred, Illinois. All 49.5 stream miles of Apple Creek were rated as fully supporting aquatic life uses.

Quiver Creek

Quiver Creek is a fourth order tributary to the Illinois River and drains approximately 261 square miles in Mason and Tazewell counties. The 30.0 stream miles of Quiver Creek were rated as fully supporting designated aquatic life uses. Water chemistry and macroinvertebrate samples indicated excellent water quality. Fish samples included the iron color shiner, a threatened species in Illinois.

McKee Creek

McKee Creek is located in west central Illinois and drains approximately 444 square miles before flowing into the Illinois River southeast of Chambersburg, Illinois. The 54.5 stream miles of McKee Creek were rated as fully supporting aquatic life uses. Water chemistry and macroinvertebrate samples indicated very good water quality and the stream supported a diverse fish community. Ambient water quality data indicates minor problems due to nutrients and total suspended solids.

Indian Creek

During July, 1992, an intensive survey was done on Indian Creek. Indian Creek drains approximately 286 square miles in Morgan and Cass counties before flowing into the Illinois River at mile 78.7. The survey consisted of four stations on Indian Creek and one on Little Indian Creek. Indian Creek is a heavily modified channelized stream with steep banks and little or no riparian border. One segment, 5.6 stream miles, was rated as fully supporting aquatic life uses. The remainder of Indian Creek was rated as partial/minor.

Otter Creek

During 1992, an intensive survey was conducted on Otter Creek. Otter Creek drains approximately 89.9 square miles in Jersey county and flows into the Illinois River at mile 14.7. Two stations were sampled. All 23.4 stream miles were rated as fully supporting designated aquatic life uses. Fish species included the slender madtom and banded sculpin which are limited to clear, high gradient streams with gravel/cobble substrates.

Table 26. Use Support for the Illinois River Basin, 1992-1993 (miles)

Degree of Use Support	OVERALL USE			INDIVIDUAL USES			
	Evaluated	Monitored	Total (01)	Fish Consumption (02)	Aquatic Life (04)	Swimming (05)	Drinking Water (07)
Full	493.9	1131.9	1635.3	368.6	1635.3	117.3	41.4
Full/Threatened		15.6	15.6		15.6		
Partial/Minor	442.7	723.7	1156.9		1156.9		31.8
Partial/Moderate	17.2	61.9	79.1		79.1	46.2	22.6
Nonsupport				119.7		249.8	
TOTAL ASSESSED	953.8	1933.1	2886.9	488.3	2886.9	413.3	95.8
Not Applicable						570.1	7637.8
Not Assessed			4846.7	7245.3	4846.7	6750.2	
TOTAL			7733.6	7733.6	7733.6	7733.6	7733.6

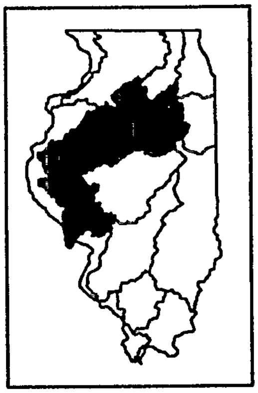


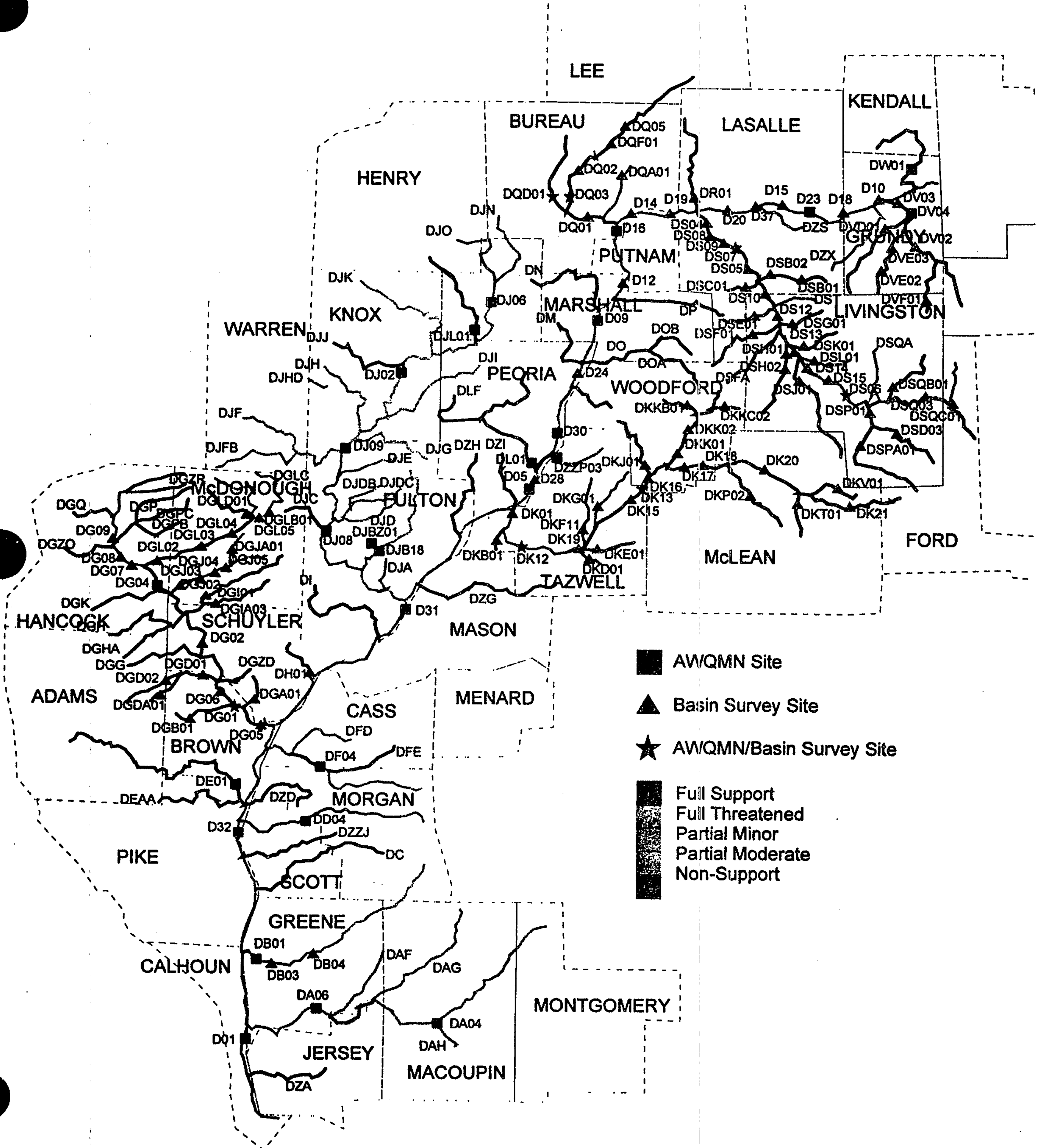
Table 27. Total Sizes of Waters Not Fully Supporting Uses Affected by Various Cause and Source Categories for the Illinois River Basin, 1992-1993 (miles)

CATEGORY	Major Impact	Moderate/ Minor Impact
CAUSES		
Priority organics		39.5
Metals	37.6	62.7
Ammonia	5.9	18.0
Nutrients	62.9	1173.1
Siltation	3.1	1145.7
Organic enrichment/DO	40.0	121.6
Salinity/TDS/Chlorides		3.0
Flow alteration		269.1
Suspended solids	43.6	101.4
SOURCES		
Industrial		52.0
Municipal	82.3	295.2
CSO's	1.3	54.6
Agriculture	410.6	774.2
Nonirrigated crop production		35.1
Pasture land	35.1	14.7
Feedlots-all types	1.7	
Urban runoff		36.4
Resource Extrac./Explor.		158.2
Hydrologic/Habitat mod		438.5
Channelization		291.4
Flow regulation/mod.		181.7
Other	37.6	67.5
Contaminated sediments	37.6	59.2
Recreation activities		8.3
Source unknown	23.1	

Legend for Figure 14.

D	Illinois R.	DJG	Littlers Cr.
DZA	Otter Cr.	DJH	Haw Cr.
DZD	Coon Run	DJHD	Brush Cr.
DZG	Quiver Cr.	DJI	French Cr.
DZH	Copperas Cr.	DJJ	Court Cr.
DZI	LaMarsh Cr.	DJK	Walnut Cr.
DZS	Covel Cr.	DJL	Indian Cr.
DZX	Waupecan Cr.	DJN	E. Fk. Spoon R.
DZZJ	Walnut Cr.	DJO	W. Fk. Spoon R.
DZZP	Farm Cr.	DK	Mackinaw R.
DA	Macoupin Cr.	DKB	Hickory Grove Ditch
DAF	Taylor Cr.	DKD	Indian Cr.
DAG	Hodges Cr.	DKE	Little Mackinaw R.
DAH	Dry Fork	DKF	Prairie Cr.
DB	Apple Cr.	DKG	Mud Cr.
DC	Sandy Cr.	DKJ	Walnut Cr.
DD	Mauvaise Terre R.	DKK	Panther Cr.
DE	McKee Cr.	DKKB	W. Panther Cr.
DEAA	Mid. Fk. McKee Cr.	DKKC	E. Panther Cr.
DF	Indian Cr.	DKP	Money Cr.
DFD	Clear Cr.	DKV	Henline Cr.
DFH	Little Indian Cr. West	DKT	Crooked Cr.
DG	La Moine R.	DL	Kickapoo Cr.
DGZD	Horney Branch	DLF	W. Br. Kickapoo Cr.
DGZO	Long Cr.	DM	Senachwine Cr.
DGZR	S. Br. La Moine R.	DN	Crow Cr. W.
DGA	Town Cr.	DO	Crow Cr. E.
DGB	West Cr.	DOA	S. Br. Crow Cr. E.
DGD	Missouri Cr.	DOB	N. Br. Crow Cr. E.
DGDA	Little Missouri Cr.	DP	Sandy Cr.
DGG	Cedar Cr.	DQ	Big Bureau Cr.
DGH	Flour Cr.	DQA	East Bureau Cr.
DGHA	Williams Cr.	DQD	W. Bureau Cr.
DGI	Camp Cr.	DQF	Masters Fork
DGIA	Grindstone Cr.	DR	Little Vermilion R.
DGJ	Troublesome Cr.	DS	Vermilion R.
DGJA	Killjordan Cr.	DSB	Otter Cr.
DGK	Bronson Cr.	DSC	Eagle Cr.
DGL	E. Fk. La Moine R.	DST	Murray Ditch
DGLC	Drowning Fork	DSE	Prairie Cr.
DGLD	Farmer Cr.	DSF	Long Point Cr.
DGP	La Harpe R.	DSFA	Mole Cr.
DGPB	Rock Cr.	DSG	Mud Cr.
DGPC	Baptist Cr.	DSH	Scattering Point Cr.
DGQ	Grove Cr.	DSJ	Rooks Cr.
DH	Sugar Cr.	DSK	Baker Run
DI	Otter Cr.	DSL	Wolf Cr.
DJ	Spoon R.	DSP	S. Fk. Vermilion R.
DJA	East Cr.	DSPA	Indian Cr.
DJB	Big Cr.	DSQ	N. Fk. Vermilion R.
DJBZ	Slug Run	DSQA	Felky Slough
DJC	Shaw Cr.	DSQB	Five Mile Cr.
DJD	Put Cr.	DSQC	Kelly Cr.
DJDB	Turkey Cr.	DV	Mazon R.
DJDC	Lost Grove Cr.	DVD	Johnny Run
DJE	Coal Cr.	DVE	W. Fk Mazon R.
DJF	Cedar Cr.	DVF	E. Fk Mazon R.
DJFB	Swan Cr.	DW	Aux Sable Cr.

Figure 14. Degree of Overall Use Support for the Illinois River Basin



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Instructions/Notes for Table 8-5

1. Identify the aquifer and hydrogeologic setting by describing the unit in as much detail as necessary to distinguish it from other aquifers in the State. Some potential descriptors to consider may be the name, location, composition, and depth to the top and bottom of the aquifer. If desired, States may append a map illustrating the general location of the aquifer or hydrogeologic setting selected for this assessment.

2. Identify the surface waterbody by name.

3. Indicate the size of the area impacted by the contamination.

4. Indicate the county(ies) in which the impacted area is located.

5. Indicate, if desired, the approximate longitude and latitude of the impacted area.

6. Record the reporting period.

7. Indicate the contaminants that are involved.

8. For each of the contaminants listed in Table 8-5, record the average and the range in concentration (when known) for surface water and ground water. Indicate the units used in the table. Report the concentration values under the appropriate heading (i.e., surface water is contaminating ground water or vice versa).

is known or strongly suspected on the basis of physical documentation or strong circumstantial evidence. Table 8-5 is optional for 1996 because EPA recognizes that many of the problems related to ground water-surface water interactions are difficult to study and limited data exist.

States are encouraged to provide a narrative with Table 8-5 that describes the source of the contamination (e.g., land application of fertilizers, septic tanks, saltwater intrusion, or animal waste holding ponds); the primary land use in the vicinity of the source (e.g., agricultural, residential, industrial, undeveloped); and a description of how the ground water-surface water interaction was determined, whether the contamination threatens drinking water availability or public health or is otherwise a source of concern, and whether contamination is transitory or long term.

Conclusion

Section 106(e) of the Clean Water Act requests that each State monitor the quality of its ground water resources and report the status to Congress in their State 305(b) reports. EPA worked with States represented on the 305(b) Consistency Ground Water Subgroup to develop a comprehensive approach to assessing ground water quality that can be applied on a national scale. The approach is consistent with previous 305(b) reporting cycles in that information on major contaminant sources in the State and progress on ground water protection are still requested. The major change is that information related to ground water quality in specific aquifers or hydrogeologic settings will be requested in 1996. Also, for the first time, States are being asked to consider ground water-surface water interactions and their effects on water management practices.

In this approach, ground water quality will be assessed in specific aquifers or hydrogeologic settings selected by States. The assessment will be based on a series of indicator parameters, including the type and number of contamination sites within the reporting area, concentrations of anthropogenic and naturally occurring constituents in the ground water as compared to national or State water quality standards, and information on natural sensitivity and/or aquifer vulnerability to land-use practices.

EPA recognizes that there will be significant variability in the degree to which States are able to respond to the data requests in these guidelines; however, it is hoped that as States develop plans and mechanisms to meet these data requests, reporting will become more uniform. In approximately 10 years, it is hoped that ground water quality will be characterized in the majority of States. As databases are developed over time, trends in ground water quality in States, Regions, and in the Nation will be evaluated as part of the 305(b) process.

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