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[Research & Risk](#)
[Assessment](#)
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[Wastewater Technology](#)
[Water Infrastructure](#)
[What You Can Do](#)

You are here: [Water](#) » [Science & Technology](#) » [Surface Water Standards & Guidance](#) » [Water Quality Standards](#) » [Handbook](#) » [Water Quality Standards Handbook – Chapter 7: Water Quality Standards and the Water Quality-based Approach to Pollution Control](#)

Water Quality Standards Handbook – Chapter 7: Water Quality Standards and the Water Quality-based Approach to Pollution Control

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Table of Contents

Introduction

7.1 Establish Water Quality Standards

7.2 Monitor Water Quality and Assess the Extent to Which Waters Meet Water Quality Standards

7.2.1 Monitor Water Quality

7.2.2 Assess the Extent to Which Waters Meet Water Quality Standards

7.3 Identify and Rank Impaired and Threatened Waters

7.4 Determine Pollutant Loading Capacity and Allocations

7.5 Establish Point and Nonpoint Source Controls

7.5.1 Point Source Controls: the National Pollutant Discharge Elimination System Permitting Process

7.5.2 Nonpoint Source Controls

7.5.3 Clean Water Act Section 401 Water Quality Certification

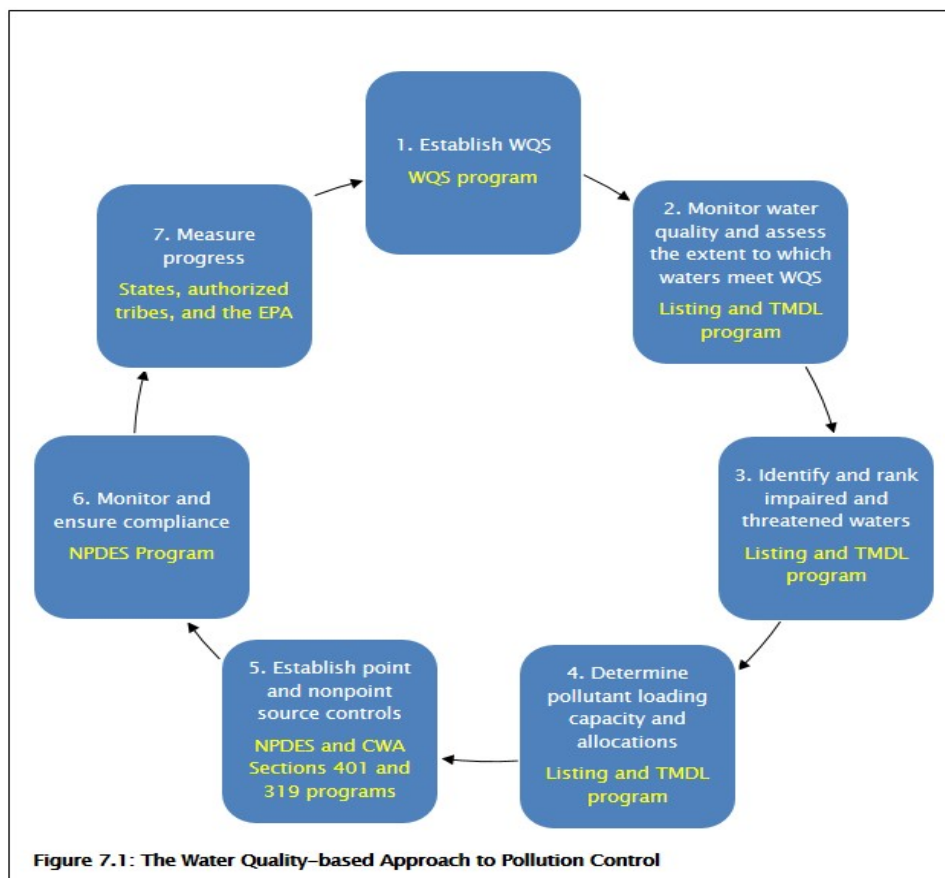
7.6 Monitor and Ensure Compliance

7.7 Measure Progress

Introduction

The [Clean Water Act \(CWA\)](#) establishes complementary technology-based and water quality-based approaches to water pollution control. The technology-based approach establishes uniform minimum technology-based requirements through effluent limitations guidelines, where available, or “best professional judgement” for non-municipal dischargers and secondary treatment requirements for publicly owned treatment works based on the capabilities of available technologies to control pollutant discharges. The water quality-based approach emphasizes the overall quality of water within a waterbody and provides a mechanism by which states and authorized tribes control the amount of pollution entering the waterbody based on the intrinsic conditions of that waterbody and the water quality standards (WQS) they establish to protect it.^{1/}

This chapter describes the water quality-based approach to pollution control and its relationship to WQS. Specifically, Section 7.1 describes establishing WQS under CWA Section 303(c), and Section 7.2 describes monitoring and assessment of waters based on such WQS through the CWA Section 303(d) listing program. Section 7.3 describes identifying and ranking waters that do not meet WQS through the Total Maximum Daily Load (TMDL) and CWA Section 303(d) listing programs. Section 7.4 describes establishing point and nonpoint source pollutant allocations through the TMDL program. Section 7.5 describes establishing point source controls through the National Pollutant Discharge Elimination System (NPDES) and CWA Section 401 certification programs as well as establishing state and tribal nonpoint source control programs developed, in part, pursuant to CWA Section 319. Section 7.6 describes monitoring to assess attainment of WQS through NPDES controls on point sources and implementation of state and tribal nonpoint source programs. Section 7.7 describes measuring progress of program performance by states, tribes, and the EPA. Figure 7.1 illustrates the overall water quality-based approach to pollution control.



↑ Top of Page

7.1 Establish Water Quality Standards

WQS are the foundation of the water quality-based approach to pollution control. WQS establish the water quality goals and define the level of protection for state and tribal waters. Once WQS are established, they form the basis for implementing other CWA programs, putting into place necessary pollution controls, and measuring progress toward achieving CWA goals. Once a state or authorized tribe has established WQS, the water quality-based approach has begun.

The preceding chapters of this Handbook provide detailed information on WQS. In particular, refer to [Chapter 2](#) for information on designated uses, [Chapter 3](#) for information on water quality criteria, and [Chapter 4](#) for information on antidegradation. Also see the EPA's [Water Quality Standards for Surface Waters webpage](#).

↑ Top of Page

7.2 Monitor Water Quality and Assess the Extent to Which Waters Meet Water Quality Standards

Once states and authorized tribes have defined water quality goals and adopted WQS (and the EPA has approved them under CWA Section 303(c)), they conduct water quality monitoring and use the data generated from such monitoring to assess whether their waters meet WQS.

7.2.1 Monitor Water Quality

In accordance with CWA Section 106(e)(1) and [40 CFR 130.4](#), states and authorized tribes establish appropriate monitoring methods and procedures necessary to compile and analyze data on the quality of their waters. Monitoring is an important element in the water quality-based approach because state and tribal monitoring programs provide the data necessary to characterize waters and support a range of CWA decision needs including the following:

- Assessing the extent to which state and tribal waters meet WQS.
- Developing, reviewing, and revising WQS.

- Identifying impaired or threatened waters.
- Establishing TMDLs.
- Supporting development of water quality-based effluent limits (WQBELs).
- Tracking trends in water quality over time.
- Identifying emerging problems.

States and tribes develop and maintain monitoring strategies that describe how monitoring objectives will be met as well as the necessary resources for implementation. For each waterbody type, these strategies include objectives, designs, indicators, quality assurance, data management, analysis and assessment, reporting, resources and infrastructure, and programmatic evaluation. Such state and tribal strategies generally identify monitoring gaps, help set monitoring priorities, and guide program enhancement funding from [Section 106 Monitoring Initiative grants](#) (e.g., new state laboratory capacities, fish tissue monitoring, data management, new biological monitoring protocols and index development). Some states and tribes have used their strategies and the identification of monitoring gaps to secure additional monitoring funding through legislative mandates. For additional information on monitoring strategies, see the EPA's *Elements of a State Water Monitoring and Assessment Program (2003)*.

The EPA recommends that states and tribes implement comprehensive monitoring programs that include statistical survey designs to report on the conditions of all waters as well as targeted monitoring to address specific programmatic needs (e.g., NPDES permits, TMDLs).

For more information on monitoring, see the EPA's [Monitoring and Assessing Water Quality webpage](#) and *Consolidated Assessment and Listing Methodology - Toward a Compendium of Best Practices (2002)*. Additionally, *The Strategy for Improving Water Quality Monitoring in the United States - Final Report of the Intergovernmental Task Force on Monitoring Water Quality (1995)* proposes actions to improve ambient water quality monitoring in the United States to allow better management of water resources.

7.2.2 Assess the Extent to Which Waters Meet Water Quality Standards

Typically, states and authorized tribes utilize both existing information and new data collected from ongoing monitoring programs to assess whether their waters meet WQS and identify water quality trends over time. States and tribes assess their waters for a variety of other purposes including targeting restoration activities, documenting the extent of contamination at potential Superfund sites, and meeting federally mandated reporting requirements in accordance with [CWA Sections 304\(l\), 305\(b\), 314\(a\), and 319](#).

States and tribes develop assessment methodologies to describe their decision-making processes for interpreting water quality data and determining WQS attainment. States and tribes may have different methods for identifying and compiling information on the status of their waterbodies depending on specific programmatic needs and organizational arrangements. The methodology generally explains the following:

- The methods by which the state or tribe identifies and solicits all existing and readily available data and information.
- The quality assurance and quality control criteria the state or tribe uses to evaluate data and information submitted by outside entities to determine the validity and applicability of such data and information.
- The analytical approaches including statistical analyses the state or tribe uses to infer true segment conditions from all valid existing and readily available data and information.

Describing the decision-making processes in the assessment methodology provides stakeholders with the opportunity to understand how the state or tribe makes its assessment decisions.

For more information on assessment, see [Section IV of the EPA's 2006 Integrated Reporting Guidance](#). Additionally, to learn the condition of local streams, lakes, and other waters anywhere in the United States, see the EPA's [How's My Waterway? webpage](#).

[↑ Top of Page](#)

7.3 Identify and Rank Impaired and Threatened Waters

In accordance with Section 303(d) of the [CWA](#), [40 CFR Part 130](#) establishes requirements for the process by which states and authorized tribes identify an impaired waterbody that is not meeting any applicable state or tribal WQS including designated uses, numeric and narrative water quality criteria, and antidegradation requirements.

States and tribes must identify any water bodies that do not meet applicable WQS on their Section 303(d) lists of

impaired waters as well as establish priority rankings and develop TMDLs for such waters. In addition to the Section 303(d) list, the CWA requires that each state and tribe report every two years on the health of all of its waters (known as the Section 305(b) report or "biennial water quality report"), not just those that are impaired. The EPA recommends that states and tribes combine the Section 303(d) list with the Section 305(b) report to create an "[integrated report](#)," which is due to the EPA by April 1 of each even-numbered year.

When using the integrated reporting approach, the EPA recommends that states and tribes report on the status of all waterbodies in the following five categories:

1. All designated uses are supported, and no use is threatened.
2. Available data and/or information indicate that some, but not all, of the designated uses are supported.
3. There is insufficient available data and/or information to make a designated use support determination.
4. Available data and/or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed.
 - 4a. A state- or tribe- developed TMDL has been approved by the EPA, or a TMDL has been established by the EPA for any segment-pollutant combination.
 - 4b. Other required control measures are expected to result in the attainment of an applicable WQS in a reasonable period of time.
 - 4c. The non-attainment of any applicable WQS for the segment is the result of pollution and is not caused by a pollutant.
5. Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed.

Category 5 constitutes the state's or tribe's Section 303(d) list.

For more information on integrated reporting, refer to the EPA's [2006 Integrated Reporting Guidance](#). Also see the EPA's [integrated reporting guidance repository](#).

A state's priority ranking for TMDL development must take into account the severity of the pollution and the uses to be made of such waters. Priority ranking has traditionally been a process defined by the state or tribe and may vary in complexity and design. A priority ranking should enable the state or tribe to make efficient use of its available resources.

In December 2013, the EPA announced a new collaborative framework for implementing the Section 303(d) program with states and tribes: [A Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303\(d\) Program](#). The new program vision details the enhancements that the EPA made to the Section 303(d) program, which were informed by the experience gained over the past two decades in assessing and reporting on water quality and in developing approximately 65,000 TMDLs. The new vision enhances overall efficiency of the Section 303(d) program and, in particular, encourages states and tribes to focus attention on priority waters. The program vision also provides states and tribes flexibility in using available tools including, but not limited to, TMDLs to attain and maintain WQS. States and tribes may consider priorities for restoration as well as protection.

For additional information on the vision for the Section 303(d) program, see the EPA's [CWA Section 303\(d\) Program Vision webpage](#).

Once states and authorized tribes have identified and prioritized impaired water bodies for TMDL development, they may decide to re-evaluate the appropriateness of the WQS for such waters during their WQS triennial review or TMDL development processes.

[↑ Top of Page](#)

7.4 Determine Pollutant Loading Capacity and Allocations

Once states and authorized tribes have established appropriate WQS and identified and ranked impaired waterbodies, they calculate pollutant budgets for the impaired waterbodies and allocate pollutant shares among point and nonpoint sources.

The [CWA](#) and [40 CFR 130.7\(c\)](#) require that states and tribes establish TMDLs for the waterbodies listed on their CWA Section 303(d) lists in accordance with their priority rankings. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive while still meeting its applicable WQS. Pollutant loadings above this amount generally will result in the waterbody not attaining WQS. In many cases, the TMDL analysis is the trigger for determining the source(s) of pollutants. TMDLs quantify pollutant sources and allocate allowable pollutant loads to the

contributing point sources through wasteload allocations and nonpoint sources through load allocations, which may include both anthropogenic and natural background sources of a pollutant. A TMDL may contain only wasteload allocations, only load allocations, or a combination of both types of allocations. A TMDL also includes a margin of safety to account for the uncertainty in predicting how well pollutant reductions will result in attaining WQS. A TMDL also accounts for seasonal variations.

States and tribes should consider the extent of pollution problems (including effects on downstream waters) and sources when defining the geographic area for TMDL development. Many water pollution concerns are area-wide phenomena caused by multiple dischargers, multiple pollutants (with potential synergistic and additive effects), re-mobilization of contaminants buried in sediment, or nonpoint sources such as runoff. Atmospheric deposition and groundwater discharge may also result in significant pollutant loadings to surface waters. As a result, the EPA recommends that states and tribes develop TMDLs on a watershed basis to manage holistically the quality of surface waters. This approach also supports sound environmental management and efficient use of limited resources. In cases where states and tribes develop TMDLs on a watershed basis, they should also consider organizing NPDES permitting cycles such that all permits in a given watershed expire at the same time.

The EPA has developed a number of specialized models and tools, including those listed on the EPA's [Water Quality Models webpage](#), to assist water quality managers in developing TMDLs, wasteload allocations, and watershed protection plans. Additional information can also be found through the EPA's [Watershed and Water Quality Modeling Technical Support Center](#).

The following links provide additional EPA information on TMDLs:

- [Impaired Waters and Total Maximum Daily Loads webpage](#).
- [Section 303\(d\) program guidance webpage](#).
- [TMDL technical support documents webpage](#)
- [Guidance for Water Quality-based Decisions: The TMDL Process \(1991\)](#).
- [TMDL Program Results Analysis webpage](#).

7.5 Establish Point and Nonpoint Source Controls

Once states and authorized tribes have established appropriate WQS, they implement source control actions to manage pollutant loadings. Such actions can be implemented for impaired waters before or after TMDL development. Generally, states, tribes, and the EPA regulate point sources through the NPDES permitting program. Federal, state and local government agencies, private land managers, and landowners manage nonpoint sources through state and tribal laws and local ordinances. States and tribes may also use the [CWA Section 401 certification process](#) to ensure that federal permits and licenses are adequate to maintain state and tribal WQS.

7.5.1 Point Source Controls: the National Pollutant Discharge Elimination System Permitting Process

In accordance with [40 CFR 122.1\(b\)](#), the NPDES program generally requires permits for the discharge of pollutants from any point source into waters of the United States.^{2/} An NPDES permit is a license for a facility to discharge a specified amount of a pollutant into a receiving waterbody under certain conditions. An NPDES permit provides the following two types of control:

- Technology-based effluent limits based on the pollutant reductions in effluents that can be achieved through application of specified levels of technology controls, taking into account the technological and economic ability of dischargers to control the discharge of pollutants in wastewater.
- WQBELs established to meet the WQS that protect the quality of the specific waterbody receiving the discharge.

By analyzing the effect of a discharge on the receiving waterbody, a permit writer could find that technology-based effluent limits alone will not achieve the applicable WQS. In such cases, Section 301(b)(1)(C) of the [CWA](#) and [40 CFR 122.44\(d\)](#) require development of WQBELs. WQBELs must derive from and comply with all applicable WQS and be consistent with the assumptions and requirements of any available wasteload allocation (e.g., a TMDL wasteload allocation).

WQBELs establish the level of effluent quality necessary to protect water quality in the receiving waterbody in order to ensure attainment of WQS. Allowable loadings are often developed as allowable wasteload allocations for specific point sources of pollutants, and WQBELs are then derived from these wasteload allocations and incorporated into NPDES permits. It is important to ensure that WQBELs account for the fact that effluent quality is often highly variable. WQBELs may be determined from a TMDL's wasteload allocation or calculated for an individual point source directly from the

applicable WQS. Wasteload allocations and WQBELs are both designed to prevent exceedances of WQS.

The following links provide additional EPA information on NPDES permitting:

- [NPDES Permit Program Basics webpage](#).
- [NPDES Permit Writers' Manual \(2010\)](#).
- [Technical Support Document for Water Quality-based Toxics Control \(1991\)](#).
- [Watershed-based NPDES Permitting webpage](#).
- [Water Quality Trading webpage](#).

7.5.2 Nonpoint Source Controls

In addition to permits for point sources, states and authorized tribes implement nonpoint source controls such as management measures or best management practices to meet surface water quality objectives (e.g., WQS and TMDL load allocations).

Section 319 of the [CWA](#) establishes a national program to control nonpoint sources of water pollution in accordance with the Section 101(a)(7) goal that "...programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution." Section 319(a) requires states and tribes to develop nonpoint source assessment reports that identify nonpoint source pollution problems and sources responsible for water quality impairments. Section 319(b) further requires states and tribes to adopt nonpoint source management programs to control nonpoint source pollution. These programs should articulate each state's or tribe's strategy to address nonpoint source pollution and to attain and maintain WQS. Such state and tribal nonpoint source management programs provide the foundation for addressing nonpoint source pollution.

To address waterbodies impaired or threatened by nonpoint source pollution, the EPA recommends that states and tribes implement their nonpoint source management programs and generally ensure implementation of control measures or practices by all significant contributors of nonpoint source pollution to the watersheds. The EPA's funding guidelines for providing Section 319 grants to states and tribes includes the expectation that watershed projects funded by Section 319 funds will follow the development of local watershed plans. These plans are required to address nine elements, one of which is a determination that the best management practices will be sufficient to meet WQS or help implement TMDL load allocations for the waterbody. Best management practices are the primary mechanism in Section 319 to enable attainment of WQS. The nine elements are described in both [Nonpoint Source Program and Grants Guidelines for States and Territories \(2013\)](#) and [Handbook for Developing Watershed Plans to Restore and Protect Our Waters \(2008\)](#).

Additional information on nonpoint source pollution and Section 319 is available on the EPA's [Clean Water Act Section 319 webpage](#) and [Polluted Runoff: Nonpoint Source Pollution webpage](#).

Section 6217 of the Coastal Zone Reauthorization Amendments of 1990 requires that states with federally approved coastal zone management programs develop coastal nonpoint pollution control programs that are approved by the EPA and the National Oceanic and Atmospheric Administration. For additional information, see the EPA's [Coastal Zone Act Reauthorization Amendments Section 6217 webpage](#).

7.5.3 Clean Water Act Section 401 Water Quality Certification

Section 401 of the [CWA](#) provides that a federal agency cannot issue a permit or license that may result in a discharge to waters of the United States unless the state or authorized tribe where the discharge would originate certifies that the discharge is consistent with certain CWA provisions as well as other appropriate provisions of state or tribal law. When making a water quality certification decision, a state or tribe may grant certification, grant certification with conditions, deny certification, or waive certification. Where the state or tribe has conditioned its Section 401 certification, each condition becomes a term of the federal permit or license (if it is issued).

The most common types of federal permits and licenses subject to Section 401 include the following:

- NPDES permits for point source discharges issued by the EPA under Section 402.
- Permits for the discharge of dredged or fill material issued by the Army Corps of Engineers under Section 404.
- Permits for activities in navigable waters that may affect navigation issued by the Army Corps of Engineers under Sections 9 and 10 of the Rivers and Harbors Act.
- Licenses required for hydroelectric projects issued by the Federal Energy Regulatory Commission under the Federal Power Act.

Congress intended for states and tribes to use the Section 401 certification process to ensure that no federal license or permits would be issued that would violate water quality objectives. Specifically, when evaluating whether to grant, condition, or deny a Section 401 certification, states and tribes consider whether the discharge, if authorized, would be consistent with effluent limitations for conventional and nonconventional pollutants, WQS, new source performance standards, and toxic pollutants (under Sections 301, 302, 303, 306, and 307). Section 401 also allows states and tribes to consider requirements of state or tribal law that may be more protective than the CWA when making a certification decision.

Protection of state and tribal WQS is the main goal of the Section 401 certification process. If a state or tribe grants water quality certification to an applicant for a federal license or permit, it is saying, in effect, that the proposed activity will comply with state or tribal WQS (and the other appropriate CWA and state or tribal law provisions). If a state or tribe denies certification, the federal permitting or licensing agency is prohibited from issuing a permit or license.

For additional information on Section 401 water quality certification, see the EPA's [Water Quality and 401 Certification webpage](#) and [Clean Water Act Section 401 Water Quality Certification: A Water Quality Protection Tool For States and Tribes \(2010\)](#).

[↑ Top of Page](#)

7.6 Monitor and Ensure Compliance

As previously noted, monitoring is a crucial element of water quality-based decision making. Once states and authorized tribes establish appropriate point and nonpoint source controls, monitoring provides the data used to assess compliance with water quality-based controls and for evaluating whether TMDLs and control actions based on such TMDLs attain WQS.

With point sources, NPDES dischargers are required to provide discharge monitoring reports, which provide a key source of effluent quality data for purposes of ensuring compliance with NPDES permits. In some instances, the permitting authority may also require dischargers to assess the impact of their discharges on the receiving water by collecting ambient monitoring data in the receiving water. Such ambient monitoring requirements can be placed into a permit as a special condition as long as the information is collected for purposes of developing a permit limit.

Based on a review of the data, the permitting authority determines whether an NPDES discharger has complied with the requirements of its permit. If a discharger has apparent violations, the permitting authority may review the discharger's compliance history, focusing on the magnitude, duration, and frequency of violations, and determine the appropriate enforcement response. The EPA, states, tribes, and citizens are authorized to bring civil or criminal action against NPDES dischargers that violate their permits.

In the case of nonpoint sources, states and tribes should ensure that effective monitoring programs are in place for evaluating nonpoint source control measures. The EPA recognizes monitoring as a high-priority activity in a state's or tribe's nonpoint source management program and encourages states and tribes to use innovative monitoring programs (e.g., rapid bioassessments and volunteer monitoring) to provide adequate point and nonpoint source monitoring coverage. Additionally, [EPA guidance on nonpoint source management plans](#) and funding watershed plans with CWA Section 319 funds have placed a heavy emphasis on managing nonpoint source pollution on a watershed basis. As a result, monitoring the effectiveness of nonpoint source pollution control activities is usually a part of the watershed approach used by state, tribal, and local organizations, universities, and local landowners and land managers (see the EPA's [Watershed Academy webpage](#) for information on the watershed approach). The EPA also provides guidance to state, tribal, and local watershed efforts through its national nonpoint source monitoring program.

State and tribal nonpoint source programs are enforced under state and tribal law.

For more information on point and nonpoint source monitoring, see the EPA's [Clean Water Act Compliance Monitoring webpage](#) and [Nonpoint Source Monitoring Guidance \(1997\)](#). See also the EPA's [Water Programs Databases and Tools webpage](#).

[↑ Top of Page](#)

7.7 Measure Progress

States and authorized tribes (and the EPA) measure progress and evaluate program performance by applying several approaches to measure progress in a cost-effective manner. One approach is tracking program activities such as permit issuance, development of TMDLs to guide restoration of impaired waters, and development of watershed

protection plans to prioritize actions to both protect healthy waters and improve degraded waters. Another approach is water quality monitoring to track conditions over time and compare them to baseline conditions.

The EPA, states, and tribes apply monitoring resources strategically to track progress as cost-effectively as possible. At a local scale, monitoring activities are targeted to assess the effectiveness of the specific controls and determine whether WQS have been attained or additional controls are necessary to attain WQS. This targeted monitoring may be part of an ongoing, fixed-site network or undertaken as a special study depending on the characteristics of the problem and the available resources.

To complement the targeted monitoring, states and tribes conduct statistical surveys of water resource conditions, which allows them to understand the quality of waters across the state or Indian reservation using an unbiased, representative sample. Such surveys also allow states and tribes to track the extent of the waters that meet WQS and whether water quality is generally improving over time.

For more information on protecting and restoring watersheds as well as EPA strategies that will drive progress toward clean water goals, see the EPA's [National Water Program: Strategic Plan and Guidance webpage](#), which describes the EPA's five-year strategic plan and the national water program's annual guidance.

[↑ Top of Page](#)

^{1/} Throughout this document, the term “states” means the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the United States Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. The term “authorized tribe” or “tribe” means an Indian tribe authorized for treatment in a manner similar to a state under [CWA](#) Section 518 for purposes of Section 303(c) WQS.

^{2/} Section 402 of the [CWA](#) establishes the NPDES program. Note that the CWA provides exemptions for certain types of point sources.

