

# **Water Quality Standards Handbook**

## **Chapter 1: General Provisions**

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## Chapter 1: General Provisions

[\(40 CFR 131.1–131.6\)](#)

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## Introduction

This chapter provides an introduction to several fundamental concepts related to water quality standards (WQS) including their purpose, basic description, waters to which they apply, and an overview of the process for EPA approval of WQS adopted by states and authorized tribes. Many of the concepts introduced in Sections 1.1-1.6 of this chapter are discussed in greater detail in other chapters of this Handbook. Specifically, Section 1.1 describes the scope of the EPA’s WQS regulations at [40 CFR Part 131](#), and Section 1.2 describes the purpose of WQS. Section 1.3 describes the applicability of WQS to waters of the United States. Sections 1.4 and 1.5 describe state and tribal as well as EPA authorities, respectively, related to WQS. Section 1.6 outlines the minimum requirements for state and tribal WQS submissions. Finally, Section 1.7 describes the additional WQS requirements applicable to states and tribes within the Great Lakes watershed.

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### 1.1 Scope of 40 CFR Part 131

The WQS regulation at [40 CFR Part 131](#) describes the requirements and procedures for states and authorized tribes to develop, adopt, review, revise, and submit WQS as well as requirements and procedures for the EPA to review, approve, disapprove, and promulgate WQS as authorized by Section 303(c) of the [Clean Water Act \(CWA\)](#).<sup>1</sup> This Handbook serves as guidance for implementing 40 CFR Part 131.

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### 1.2 Purpose of Water Quality Standards

WQS are the foundation for a wide range of programs under the [CWA](#). They serve multiple purposes including establishing the water quality goals for a specific waterbody, or portion thereof, and providing the regulatory basis for establishing water quality-based effluent limits (WQBELs) beyond

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<sup>1</sup> Throughout this document, the term “states” means the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the 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.

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the technology-based levels of treatment required by CWA Sections 301(b) and 306. WQS also serve as a target for CWA restoration activities such as total maximum daily loads (TMDLs).

WQS consist of the following elements:

- Designated use or uses such as “supporting aquatic life” or “recreation” (which are described in [Chapter 2](#) of this Handbook).
- Water quality criteria necessary to protect the designated uses (which are described in [Chapter 3](#) of this Handbook).
- Antidegradation requirements (which are described in [Chapter 4](#) of this Handbook).
- General policies affecting the application and implementation of WQS that states and authorized tribes may include at their discretion (e.g., mixing zone, variance, and critical low-flow policies, which are described in [Chapter 5](#) of this Handbook).

States and tribes establish WQS to meet the objectives set forth in Section 101(a), which are as follows:

- Restore and maintain the chemical, physical, and biological integrity of the Nation's waters.
- Wherever attainable, achieve a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water.

Section 303(c) instructs states and tribes to consider these objectives in establishing WQS as well as the water’s use and value for public water supplies and agricultural, industrial, and other purposes including navigation.

WQS establish the environmental baselines used for measuring the success of CWA programs, so adequate protection of aquatic life and wildlife, recreational uses, and sources of drinking water, for example, depends on developing and adopting well-crafted WQS. CWA programs such as TMDLs developed under Section 303(d), Section 305(b) reporting, Section 401 water quality certification, Section 404 permitting for the discharge of dredged and fill material, and WQBELs in discharge permits issued under the National Pollutant Discharge Elimination System (NPDES) under Section 402 depend on such WQS (as discussed in [Chapter 7](#) of this Handbook). Setting clear baselines is also important for other activities including watershed planning, protection, and restoration as well as innovations such as market-based incentives and trading.

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### 1.3 Applicability of Water Quality Standards to Waters of the United States

The [CWA](#) requires states and authorized tribes to establish WQS for navigable waters, i.e., “waters of the United States.” The latter term is specified in Section 502 of the CWA and defined by the EPA and the Army Corps of Engineers at [40 CFR 230.3](#) and [33 CFR Part 328](#), respectively.

The term has also been discussed in EPA guidance and has been further interpreted by a series of legal decisions in federal courts including the United States Supreme Court. In some situations, the EPA and the Army Corps of Engineers have interpreted the case law in making jurisdictional determinations for specific waterbodies. See the EPA's [Clean Water Act Definition of "Waters of the U.S. webpage"](#) for additional information.

The CWA indicates that all of its programs protect waters of the United States, and as a result, there is only one definition for that key threshold term. Thus, the EPA has not defined waters of the United States separately for WQS but, instead, relies on the established definitions, interpretations, and decisions described above in administering the WQS program.

States and tribes may choose to expand their coverage of WQS beyond waters of the United States to include other waters as "waters of the state." For example, a state or tribe may specifically designate isolated wetlands (that do not meet the definition of waters of the United States) as waters to which state and tribal WQS apply.

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## 1.4 State and Tribal Authority

### 1.4.1 General Provisions

Under Section 303(c) of the [CWA](#), states and authorized tribes are responsible for reviewing, revising, and adopting WQS and submitting such WQS to the EPA for review and approval or disapproval. Consistent with Section 510, states and tribes may develop WQS more stringent than required by the CWA and the EPA's implementing regulations at [40 CFR Part 131](#).

### 1.4.2 State and Tribal Authority over Federally Permitted Activities

Under Section 401 of the [CWA](#), states and authorized tribes have authority to issue water quality certifications for certain federally permitted or licensed activities. This authority allows states and tribes to influence the design and operation of projects affecting waters in their jurisdiction. Certifications under Section 401 ensure that federal permits and licenses for activities that may result in a discharge comply with applicable CWA requirements including state or tribal WQS as well as with any other appropriate requirements of state or tribal law. Section 401 does not apply to non-federal permits or licenses such as permits issued by a state or tribe authorized to administer the NPDES or Section 404 programs.

Section 401 applies to all federal agencies that grant a license or permit that may result in a discharge to waters of the United States. Examples of such licenses or permits include the following:

- EPA-issued permits for point source discharges under Section 402.

- Permits for discharges of dredged or fill material under Section 404.
- Permits for activities in navigable waters that may affect navigation under Sections 9 and 10 of the Rivers and Harbors Act.
- Federal Energy Regulatory Commission licenses required for hydroelectric projects issued under the Federal Power Act.

Section 401 certifications are generally issued by the state or tribe under whose jurisdiction the discharge originates.

A tribe eligible for treatment in a manner similar to a state (TAS) for purposes of WQS can likewise assume authority for issuing Section 401 certifications for project discharges originating in its reservation once it designates a certifying agency. See [40 CFR 121.1\(e\)](#) and [40 CFR 131.4\(c\)](#). The EPA retains authority for issuing water quality certifications within Indian country where a tribe has not been approved as eligible for TAS for WQS and water quality certifications.

When making a certification decision, the certifying entity may grant certification, grant certification with conditions, deny certification, or waive certification. If the state or tribe conditions its certification, all conditions must become terms of the permit or license if it is issued. If the certifying entity denies certification, the federal permitting or licensing agency is prohibited from issuing the permit or license. Certifications are subject to review and comment by neighboring states and tribes, and the federal agency must address concerns they raise.

For additional information on state and tribal authority under Section 401, see the EPA's [Water Quality and 401 Certification webpage](#).

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## 1.5 EPA Authority

### 1.5.1 What Provisions Constitute New or Revised Water Quality Standards under Clean Water Act Section 303(c)

The [CWA](#) requires states and authorized tribes to adopt new or revised WQS and then submit them to the EPA for review and approval or disapproval action. The EPA has the authority and duty under CWA Section 303(c)(3) to approve or disapprove new or revised WQS.<sup>2</sup>

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<sup>2</sup> In 2004, the United States Court of Appeals for the Eleventh Circuit ruled that the EPA has a mandatory duty to approve or disapprove a new or revised WQS even if the state did not submit such new or revised WQS to the EPA for review. (See *Florida Public Interest Research Group Citizen Lobby, Inc., et al. v. EPA*, 386 F.3d 1070 (11th Cir. 2004)). Thus, the EPA's authority and duty to approve or disapprove a new or revised WQS is not dependent upon whether the provision was submitted to the EPA for review. Since the 2004 decision, determining which provisions constitute new or revised WQS that the EPA has the authority and duty to review and approve or disapprove has increasingly

The EPA considers four questions when evaluating whether a provision constitutes a new or revised WQS that the EPA has the authority and duty to review and approve or disapprove under Section 303(c)(3). If the answer to **ALL** four questions is “yes,” then the provision would likely constitute a new or revised WQS that the EPA has the authority and duty to review and approve or disapprove. If the answer to any of the four questions is “no,” then the provision would not likely constitute a new or revised WQS that the EPA has the authority and duty to review and approve or disapprove.

1. Is it a legally binding provision adopted or established pursuant to state or tribal law? This consideration stems from the use of the terms “adopt,” “law,” “regulations”, and “promulgate” in Section 303(a)–(c) and from the EPA's regulation at [40 CFR 131.3\(i\)](#), which specifies that WQS “are provisions of state or federal law.” The EPA considers documents incorporated by reference into state or tribal law to be legally binding provisions adopted or established pursuant to state or tribal law.

**AND**

2. Does the provision address designated uses, water quality criteria (narrative or numeric) to protect designated uses, and/or antidegradation requirements for waters of the United States? The CWA, the EPA's implementing regulations, and case law have broadly established three core components of WQS, which are designated uses, criteria, and antidegradation requirements. Therefore, this consideration explicitly specifies that, for a provision to be a WQS, it must include or address at least one of these three core components.

**AND**

3. Does the provision express or establish the desired condition (e.g., designated uses, criteria) or instream level of protection (e.g., antidegradation requirements) for waters of the United States immediately or mandate how it will be expressed or established for such waters in the future? This consideration recognizes that, if a provision meets the above two considerations and expresses the desired condition or level of protection for waters of the United States, it may be a new or revised WQS that the EPA has the authority and duty to review and approve or disapprove under Section 303(c)(3), regardless of whether that expression applies immediately or will be applied in the future. EPA action on provisions that may not apply immediately will ensure that the EPA is able to provide input as early as possible in the state's or tribe's WQS development process, thus enabling states, tribes, and the EPA to carry out their functions under the CWA in the most efficient, expedient manner possible.

**AND**

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become more difficult, as state and tribal water programs are becoming more integrated with implementation policies and procedures.

4. Does the provision establish a new WQS or revise an existing WQS? While a provision may meet the first three considerations, the EPA's authority and duty to review and approve or disapprove such provisions under Section 303(c)(3) are limited to those WQS that are new or revised. A provision that establishes a new WQS or has the effect of changing an existing WQS would meet this consideration. In contrast, a provision that simply implements a WQS without revising it would not constitute a new or revised WQS.

The EPA considers non-substantive edits to existing WQS to constitute new or revised WQS that the EPA has the authority and duty to review and approve or disapprove under Section 303(c)(3). While such revisions do not substantively change the meaning or intent of the existing WQS, treating such non-substantive changes in this manner ensures public transparency concerning which provisions are effective for purposes of the CWA. The EPA notes that the scope of its action in reviewing and approving or disapproving such non-substantive changes would extend only as far as the actual non-substantive changes themselves. In other words, the EPA's action on non-substantive changes to previously approved WQS would not constitute an action on the underlying, previously approved WQS. Challenges to the EPA's prior approval of the underlying WQS would be subject to any applicable statute of limitations and prior judicial decisions.

For additional information on determining what provisions constitute new or revised WQS, see the EPA's document [What is a New or Revised Water Quality Standard Under CWA Section 303\(c\)? Frequently Asked Questions \(2012\)](#).

### 1.5.2 EPA Authority for Review of State and Tribal Water Quality Standards

Once the EPA determines that a provision meets the four considerations for a new or revised WQS described in Section 1.5.1 of this chapter, the next step is for the EPA to determine whether it can approve the provision.

Section 303(c) of the [CWA](#) requires the EPA to review and approve or disapprove new or revised state and tribal WQS based on the requirements of the CWA. The CWA specifies that the EPA must approve new or revised WQS within 60 days after the date of submission or disapprove such WQS within 90 days after the date of submission.

Consistent with Section 510, states and authorized tribes may adopt any requirements regarding control or abatement of pollution as long as such requirements are not less stringent than the requirements of the CWA. Thus, the EPA is generally not authorized to disapprove a state or tribal WQS on the basis that the EPA considers the WQS to be too stringent

If the EPA determines that the new or revised state or tribal WQS are consistent with the CWA and [40 CFR Part 131](#), the EPA approves the WQS. However, the EPA disapproves the WQS if they are not consistent with the CWA. In the case of disapproval, the EPA must promptly propose federal WQS under Section 303(c)(4)(A) and promulgate such WQS within 90 days of proposal, provided that the



state or tribe does not make appropriate corrections within 90 days. The EPA may approve some provisions and not others within the same WQS submission.

The EPA may also promulgate a new or revised federal WQS where the Administrator determines under Section 303(c)(4)(B) that such a WQS is necessary to meet the requirements of the CWA, and no WQS have been submitted for the EPA to disapprove under Section 303(c)(4)(A). This situation could occur, for instance, if the EPA determines that particular WQS provisions are missing from a state's or tribe's currently applicable WQS or that the current WQS do not otherwise meet the requirements of the CWA.

[Chapter 6](#) of this Handbook describes the EPA's WQS review process in more detail.

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## 1.6 Minimum Requirements for State and Tribal Water Quality Standards Submissions

When states or authorized tribes submit new or revised WQS for the EPA to review, they must include both the WQS provisions themselves as well as certain accompanying information, consistent with [40 CFR 131.6 and 131.20\(c\)](#). The submitted WQS provisions may include one or more of the following elements:

- Use designations consistent with the provisions of Sections 101(a)(2) and 303(c)(2) of the [CWA](#).
- Water quality criteria sufficient to protect the designated uses.
- An antidegradation policy consistent with 40 CFR 131.12.<sup>3</sup>

Additionally, under 40 CFR 131.13, states and tribes may, at their discretion, include in their WQS general policies affecting the application and implementation of WQS (e.g., mixing zone, variance, and critical low-flow policies). Whenever a state or tribe submits new or revised WQS provisions, the submission must also include the following items:

- Methods used and analyses conducted to support the WQS provisions.
- Certification by the state attorney general, tribal legal authority, or other appropriate legal authority within the state or tribe that the WQS were duly adopted pursuant to state or tribal law.
- General information to aid the EPA in determining the adequacy of the scientific bases of the WQS that do not include the uses specified in Section 101(a)(2) as well as information on

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<sup>3</sup> States and authorized tribes must also identify the methods for implementing the antidegradation policy in accordance with [40 CFR 131.12\(a\)](#).

general policies applicable to state and tribal WQS that may affect their application and implementation.

The EPA may also request additional information from the state or tribe to aid in determining the adequacy of the WQS.

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## 1.7 Requirements for States and Authorized Tribes within the Great Lakes Watershed

[Water Quality Guidance for the Great Lakes System at 40 CFR Part 132](#), which arose as part of a larger effort called the Great Lakes Initiative or GLI, imposes additional requirements on the WQS, TMDL, and NPDES permit programs of Great Lakes states and authorized tribes in accordance with Section 118(c)(2) of the [CWA](#).<sup>4</sup> This regulation applies with respect to waters within the Great Lakes watershed, which includes the Great Lakes themselves and all the streams, rivers, lakes, and other waterbodies within the portion of the Great Lakes drainage basin under jurisdiction of the United States.

States and tribes with waters in the Great Lakes watershed must comply with both [40 CFR Part 131](#) and 40 CFR Part 132. Thus, the EPA recommends that such states and tribes use this Handbook, which is focused on 40 CFR Part 131, in conjunction with 40 CFR Part 132 in establishing and managing their WQS programs. As a general matter, a state or tribe may not use a provision in 40 CFR Part 131 to negate a counterpart provision in 40 CFR Part 132 or vice versa.

The EPA has established the online [Great Lakes Initiative Clearinghouse](#) as a central location for information on water quality criteria, toxicity data, exposure parameters, and other supporting documents used in developing WQS in the Great Lakes watershed. States and tribes can use the Clearinghouse to help derive criteria for pollutants without specific numeric criteria published in 40 CFR Part 132. The target audience for the Clearinghouse is state and tribal environmental agencies in the Great Lakes watershed as well as other interested parties with a technical background.

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<sup>4</sup> Although [CWA](#) Section 118(c)(2) uses the term “guidance,” the EPA issued [40 CFR Part 132](#) as a binding regulation because the statute *requires* Great Lakes states and authorized tribes to adopt provisions consistent with the guidance.



**EPA**

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# Water Quality Standards Handbook

## CHAPTER 2: DESIGNATION OF USES

*The WQS Handbook does not impose legally binding requirements on the EPA, states, tribes or the regulated community, nor does it confer legal rights or impose legal obligations upon any member of the public. The Clean Water Act (CWA) provisions and the EPA regulations described in this document contain legally binding requirements. This document does not constitute a regulation, nor does it change or substitute for any CWA provision or the EPA regulations.*

# Water Quality Standards Handbook

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## CHAPTER 2 DESIGNATION OF USES

### 2.1 Use Classification – 40 CFR 131.10(a)

A water quality standard defines the water quality goals of a water body or portion thereof, in part, by designating the use or uses to be made of the water. States adopt water quality standards to protect public health or welfare, enhance the quality of water, and serve the purposes of the Clean Water Act. "Serve the purposes of the Act" (as defined in sections 101(a)(2), and 303(c) of the Act) means that water quality standards should:

- provide, wherever attainable, water quality for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water ("fishable/swimmable"), and
- consider the use and value of State waters for public water supplies, propagation of fish and wildlife, recreation, agriculture and industrial purposes, and navigation.

These sections of the Act describe various uses of waters that are considered desirable and should be protected. The States must take these uses into consideration when classifying State waters and are free to add use classifications. Consistent with the requirements of the Act and Water Quality Standards Regulation, States are free to develop and adopt any use classification system they see as appropriate, except that waste transport and assimilation is not an acceptable use in any case (see 40 CFR 131.10(a)).

Among the uses listed in the Clean Water Act, there is no hierarchy. EPA's Water Quality Standards Regulation emphasizes the uses specified in section 101(a)(2) of the Act (first bullet, above). To be consistent with the 101(a)(2) interim goal of the Act, States must provide water quality for the *protection and propagation of fish, shellfish, and wildlife, and provide for recreation in and on the water* ("fishable/swimmable") where attainable (see 40 CFR 131.10(j)).

#### DESIGNATED USES 40 CFR 131.3(f)

Uses specified in Water Quality Standards for each water body or segment whether or not they are being attained.

#### UPDATED INFORMATION

##### Use Classification

[2002 Symposium on Designated Uses](#) – This website links to proceedings from these discussions, which highlighted a desire for clear guidance on designating uses and using subcategories and other use refinements to ensure adequate designation.

[Coordinating CSO Long-Term Planning with Water Quality Reviews \(2001\) \(PDF\) \(79 pp, 498K\)](#) – This document provides guidance on how states and tribes should implement the CSO control policy and other wet weather water pollution control programs to attain water quality standards.

##### Federal Rules Involving Designated Uses

[Water Quality Standards for Puerto Rico \(2004\)](#) - This federal register notice promulgated primary contact recreation uses and associated water quality criteria for six water bodies.

[Water Quality Standards for Kansas \(2003\)](#) – This federal register notice promulgated primary and secondary contact recreation uses and aquatic life uses for a large number of water bodies to replace previously disapproved uses.

[Advanced Notice of Proposed Rulemaking for Water Quality Standards \(1998\)](#) -See pages 36748 to 36762 for an overview of designated uses policy and EPA's thinking on program development in 1998.

[Water Quality Standards for Idaho \(1997\)](#) - This federal register notice promulgated use designations for five water bodies as well as a variance procedure.

### **2.1.1 Public Water Supplies**

This use includes waters that are the source for drinking water supplies and often includes waters for food processing. Waters for drinking water may require treatment prior to distribution in public water systems.

### **2.1.2 Protection and Propagation of Fish, Shellfish, and Wildlife**

This classification is often divided into several more specific subcategories, including coldwater fish, warmwater fish, and shellfish. For example, some coastal States have a use specifically for oyster propagation. The use may also include protection of aquatic flora. Many States differentiate between self-supporting fish populations and stocked fisheries. Wildlife protection should include waterfowl, shore birds, and other water-oriented wildlife.

#### ***TYPES OF USES CWA SECTION 303(c)(2)(A)***

- Public water supplies
- Protection and propagation of fish, shellfish, and wildlife
- Recreation
- Agriculture
- Industry
- Navigation
- Coral reef preservation
- Marinas
- Groundwater recharge
- Aquifer protection
- Hydroelectric power

### **2.1.3 Recreation**

Recreational uses have traditionally been divided into primary contact and secondary contact recreation. The primary contact recreation classification protects people from illness due to activities involving the potential for ingestion of, or immersion in, water. Primary contact recreation usually includes swimming, water-skiing, skin-diving, surfing, and other activities likely to result in immersion. The secondary contact recreation classification is protective when immersion is unlikely. Examples are boating, wading, and rowing. These two broad uses can be logically subdivided into an almost infinite number of subcategories (e.g., wading, fishing, sailing, powerboating, rafting.). Often fishing is considered in the recreational use categories.

Recreation in and on the water, on the other hand, may not be attainable in certain waters, such as wetlands, that do not have sufficient water, at least seasonally. However, States are encouraged to recognize and protect recreational uses that do not directly involve contact with water, including hiking, camping, and bird watching.

A number of acceptable State options may be considered for designation of recreational uses.

### Option 1

Designate primary contact recreational uses for all waters of the State, and set bacteriological criteria sufficient to support primary contact recreation. This option fully conforms with the requirement in section 131.6 of the Water Quality Standards Regulation to designate uses consistent with the provisions of sections 101(a)(2) and 303(c)(2) of the CWA. States are not required to conduct use attainability analyses (for recreation) when primary contact recreational uses are designated for all waters of the State.

### Option 2

Designate either primary contact recreational uses or secondary contact recreational uses for all waters of the State and, where secondary contact recreation is designated, set bacteriological criteria sufficient to support primary contact recreation. EPA believes that a secondary contact recreational use (with criteria sufficient to support primary contact recreation) is consistent with the CWA section 101(a)(2) goal. The rationale for this option is discussed in the preamble to the Water Quality Standards Regulation, which states: ". . . even though it may not make sense to encourage use of a stream for swimming because of the flow, depth or the velocity of the water, the States and EPA must recognize that swimming and/or wading may occur anyway. In order to protect public health, States must set criteria to reflect recreational uses if it appears that recreation will in fact occur in the stream." Under this option, future revisions to the bacteriological criterion for specific stream segments would be subject to the downgrading provisions of the Federal Water Quality Standards Regulation (40 CFR 131.10).

### Option 3

Designate either primary contact recreation, secondary contact recreation (with bacteriological criteria sufficient to support primary contact recreation), or conduct use attainability analyses demonstrating that recreational uses consistent with the CWA section 101(a)(2) goal are not attainable for all waters of the State. Such use attainability analyses are required by section 131.10 of the Water Quality Standards Regulation, which also specifies six factors that may be used by States in demonstrating that attaining a use is not feasible. Physical factors, which are important in determining attainability of aquatic life uses, may not be used as the basis for not designating a recreational use consistent with the CWA section 101(a)(2) goal. This precludes States from using 40 CFR 131.10(g) factor 2 (pertaining to low-flows) and factor 5 (pertaining to physical factors in general). The basis for this policy is that the States and EPA have an obligation to do as much as possible to protect the health of the public. In certain instances, people will use whatever water bodies are available for recreation, regardless of the physical conditions. In conducting use attainability analyses (UAAs) where available data are scarce or nonexistent, sanitary surveys are useful in determining the sources of bacterial water quality indicators. Information on land use is also useful in predicting bacteria levels and sources.

### Other Options

- States may apply bacteriological criteria sufficient to support primary contact recreation with a rebuttable presumption that the indicators show the presence of human fecal pollution. Rebuttal of this presumption, however, must be based on a sanitary survey that demonstrates a lack of contamination from human sources. The basis for this option is the



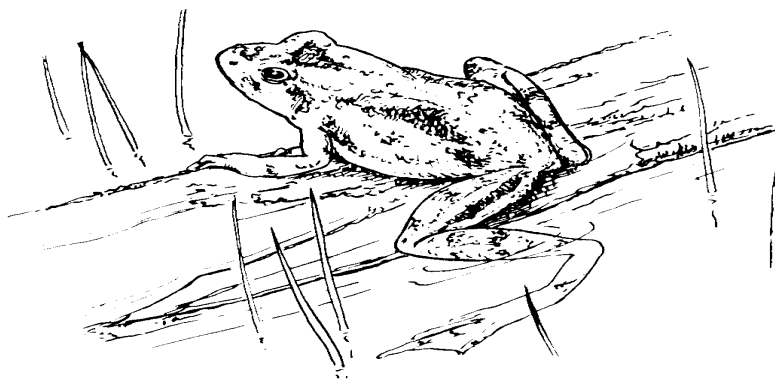
absence of data demonstrating a relationship between high densities of bacteriological water quality indicators and increased risk of swimming-associated illness in animal-contaminated waters. Maine is an example of a State that has successfully implemented this option.

- Where States adopt a standards package that does not support the swimmable goal and does not contain a UAA to justify the omission, EPA may conditionally approve the package provided that (1) the State commits, in writing, to a schedule for rapid completion of the UAAs, generally within 90 days (see conditional approval guidance in section 6.2 of this Handbook); and (2) the omission may be considered a minor deficiency (i.e., after consultation with the State, EPA determines that there is no basis for concluding that the UAAs would support upgrading the use of the water body). Otherwise, failure to support the swimmable goal is a major deficiency and must be disapproved to allow prompt Federal promulgation action.
- States may conduct basinwide use attainability analyses if the circumstances relating to the segments in question are sufficiently similar to make the results of the basinwide analyses reasonably applicable to each segment.

States may add other recreation classifications as they see fit. For example, one State protects "consumptive recreation" (i.e., "human consumption of aquatic life, semi-aquatic life, or terrestrial wildlife that depend on surface waters for survival and well-being"). States also may adopt seasonal recreational uses (see section 2.6, this Handbook).

#### 2.1.4 Agriculture and Industry

The agricultural use classification defines waters that are suitable for irrigation of crops, consumption by livestock, support of vegetation for range grazing, and other uses in support of farming and ranching and protects livestock and crops from injury due to irrigation and other exposures. The industrial use classification includes industrial cooling and process water supplies. This classification protects industrial equipment from damage from cooling and/or processwaters. Specific criteria would depend on the industry involved.



The *Report of the Committee on Water Quality Criteria*, the "Green Book" (FWPCA, 1968) and *Water Quality Criteria 1972*, the "Blue Book" (NAS/NAE, 1973) provide information for certain parameters on protecting agricultural and industrial uses, although section 304(a)(1) criteria for protecting these uses have not been specifically developed for numerous other parameters, including toxics.

Where criteria have not been specifically developed for agricultural and industrial uses, the criteria developed for human health and aquatic life are usually sufficiently stringent to protect these uses. States also may establish criteria specifically designed to protect these uses.

### 2.1.5 Navigation

States may adopt other uses they consider to be necessary. Some examples include coral reef preservation, marinas, groundwater recharge, aquifer protection, and hydroelectric power. States also may establish criteria specifically designed to protect these uses.

### 2.1.6 Other Uses

States may adopt other uses they consider to be necessary. Some examples include coral reef preservation, marinas, groundwater recharge, aquifer protection, and hydroelectric power. States also may establish criteria specifically designed to protect these uses.

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## 2.2 Consider Downstream Uses – 40 CFR 131.10(b)

When designating uses, States should consider extraterritorial effects of their standards. For example, once States revise or adopt standards, upstream jurisdictions will be required, when revising their standards and issuing permits, to provide for attainment and maintenance of the downstream standards.

Despite the regulatory requirement that States ensure downstream standards are met when designating and setting criteria for waters, occasionally downstream standards are not met owing to an upstream pollutant source. The Clean Water Act offers three solutions to such problems.

First, the opportunity for public participation for new or revised water quality standards provides potentially affected parties an approach to avoiding conflicts of water quality standards. States and Tribes are encouraged to keep other States informed of their water quality standards efforts and to invite comment on standards for common water bodies.

Second, permit limits under the National Pollutant Discharge Elimination System (NPDES) program (see section 402 of the Act) are required to be developed such that applicable water quality standards are achieved. The permit issuance process also includes opportunity for public participation and, thus, provides a second opportunity to consider and resolve potential problems regarding extraterritorial effects of water quality standards. In a decision in *Arkansas v. Oklahoma* (112 section 1046, February 26, 1992), the U.S. Supreme Court held that the Clean Water Act clearly authorized EPA to require that point sources in upstream States not violate water quality standards in downstream States, and that EPA's interpretation of those standards should govern.

Third, NPDES permits issued by EPA are subject to certification under the requirements of section 401 of the Act. Section 401 requires that States grant, deny, or condition "certification" for federally permitted or licensed activities that may result in a discharge to waters of the United States. The decision to grant or to deny certification, or to grant a conditional certification is based

### UPDATED INFORMATION

[EPA Response to Sierra Club Petition Regarding Defined Portions of the Mississippi and Missouri Rivers \(2004\)](#) –This EPA response evaluated current WQS and existing scientific knowledge at the time for each pollutant and designated use at issue within the petition area. It also provided EPA's current perspective on downstream use protection and identified a path forward for better understanding the science of numeric nutrient criteria in large rivers.

on a State's determination regarding whether the proposed activity will comply with applicable water quality standards and other provisions. Thus, States may deny certification and prohibit EPA from issuing an NPDES permit that would violate water quality standards. Section 401 also allows a State to participate in extraterritorial actions that will affect that State's waters if a federally issued permit is involved.

In addition to the above sources for solutions, when the problem arises between a State and an Indian Tribe qualified for treatment as a State for water quality standards, the dispute resolution mechanism could be invoked (see section 1.7, of this Handbook).

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## 2.3 Use Subcategories – 40 CFR 131.10(c)

States are required to designate uses considering, at a minimum, those uses listed in section 303(c) of the Clean Water Act (i.e., public water supplies, propagation of fish and wildlife, recreation, agriculture and industrial purposes, and navigation). However, flexibility inherent in the State process for designating uses allows the development of subcategories of uses within the Act's general categories to refine and clarify specific use classes. Clarification of the use class is particularly helpful when a variety of surface waters with distinct characteristics fit within the same use class, or do not fit well into any category. Determination of non-attainment in waters with broad use categories may be difficult and open to alternative interpretations. If a determination of non-attainment is in dispute, regulatory actions will be difficult to accomplish (USEPA, 1990a).

The State selects the level of specificity it desires for identifying designated uses and subcategories of uses (such as whether to treat recreation as a single use or to define a subcategory for secondary recreation). However, the State must be at least as specific as the uses listed in sections 101(a) and 303(c) of the Clean Water Act.

Subcategories of aquatic life uses may be on the basis of attainable habitat (e.g., coldwater versus warmwater habitat); innate differences in community structure and function (e.g., high versus low species richness or productivity); or fundamental differences in important community components (e.g., warmwater fish communities dominated by bass versus catfish). Special uses may also be designated to protect particularly unique, sensitive, or valuable aquatic species, communities, or habitats.

Data collected from biosurveys as part of a developing biocriteria program may assist States in refining aquatic life use classes by revealing consistent differences among aquatic communities inhabiting different waters of the same designated use. Measurable biological attributes could then be used to divide one class into two or more subcategories (USEPA, 1990a).

If States adopt subcategories that do not require criteria sufficient to fully protect the goal uses in section 101(a)(2) of the Act (see section 2.1, above), a use attainability analysis pursuant to 40 CFR 131.10(j) must be conducted for waters to which these subcategories are assigned. Before adopting subcategories of uses, States must provide notice and opportunity for a public hearing because these actions are changes to the standards.

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## 2.4 Attainability of Uses – 40 CFR 131.10(d)

When designating uses, States may wish to designate only the uses that are attainable. However, if the State does not designate the uses specified in section 101(a)(2) of the Act, the State must perform a use attainability analysis under section 131.10(j) of the regulation. States are encouraged to designate uses that the State believes can be attained in the future.

"Attainable uses" are, at a minimum, the uses (based on the State's system of water use classification) that can be achieved 1) when effluent limits under sections 301(b)(1)(A) and (B) and section 306 of the Act are imposed on point source dischargers and 2) when cost-effective and reasonable best management practices are imposed on nonpoint source dischargers.

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## 2.5 Public Hearing for Changing Uses – 40 CFR 131.10(e)

### UPDATED INFORMATION

[A Framework for Incorporating Community Preferences in Use Attainment and Related Water Quality Decision-Making \(2010\)](#) –This document clarifies that estimating the gains from use attainment is not required by the CWA or Water Quality Standards regulation, but evaluating community preferences for water quality against the costs may aid in conducting a balanced analysis.

The Water Quality Standards Regulation requires States to provide opportunity for public hearing before adding or removing a use or establishing subcategories of a use. As mentioned in section 2.2 above, the State should consider extraterritorial effects of such changes.

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## 2.6 Seasonal Uses – 40 CFR 131.10(f)

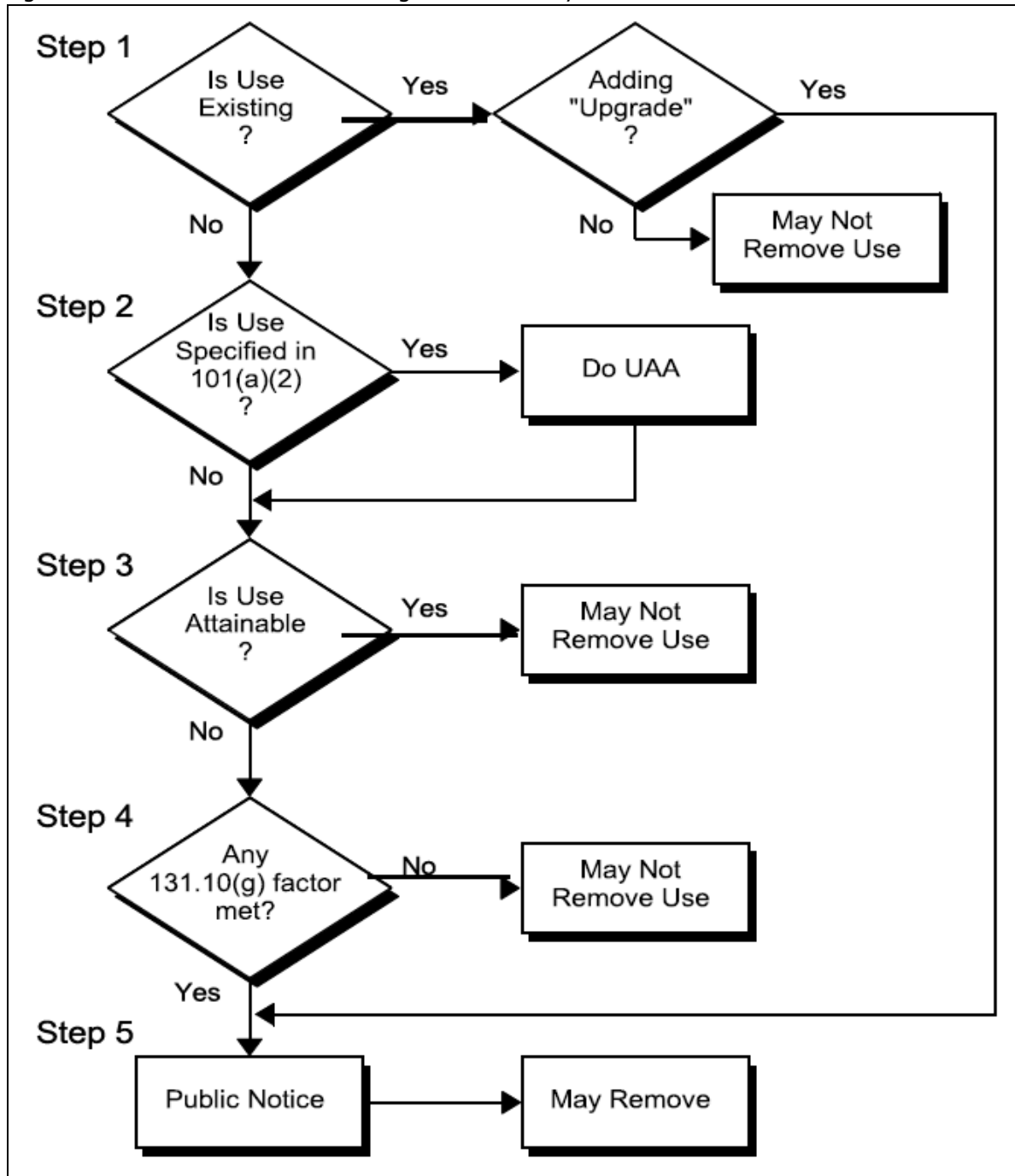
In some areas of the country, uses are practical only for limited seasons. EPA recognizes seasonal uses in the Water Quality Standards Regulation. States may specify the seasonal uses and criteria protective of that use as well as the time frame for the ". . . season, so long as the criteria do not prevent the attainment of any more restrictive uses attainable in other seasons."

For example, in many northern areas, body contact recreation is possible only a few months out of the year. Several States have adopted primary contact recreational uses, and the associated microbiological criteria, for only those months when primary contact recreation actually occurs, and have relied on less stringent secondary contact recreation criteria to protect for incidental exposure in the "non-swimming" season.

Seasonal uses that may require more stringent criteria are uses that protect sensitive organisms or life stages during a specific season such as the early life stages of fish and/or fish migration (e.g., EPA's *Ambient Water Quality Criteria for Dissolved Oxygen* (see Appendix I) recommends more stringent dissolved oxygen criteria for the early life stages of both coldwater and warmwater fish).

## 2.7 Removal of Designated Uses – 40 CFR 131.10(g) and (h)

Figure 2-1 shows how and when designated uses may be removed.



## UPDATED INFORMATION

[Letter: Mr. Derek Smithee, State of Oklahoma Water Resources Board. Questions and Answers on EPA's Existing Use Policy \(2008\) \(PDF\) \(12 pp, 3.8MB\)](#) – This letter answers Oklahoma's questions on several issues related to existing uses, including the difference between an existing and a designated use and how existing uses might be determined.

[Water Quality Standards: Examples of Alternatives to Changing Long-term Designated Uses to Achieve Water Quality Goals \(2005\) \(PDF\) \(14 pp, 830K\)](#) – These case studies, developed by States and EPA, present initial examples of approaches and tools that provide potential alternatives to changing long-term underlying designated uses and criteria.

### 2.7.1 Step 1 – Is the Use Existing?

Once a use has been designated for a particular water body or segment, the water body or water body segment cannot be reclassified for a different use except under specific conditions. If a designated use is an existing use (as defined in 40 CFR 131.3) for a particular water body, the existing use cannot be removed unless a use requiring more stringent criteria is added (see section 4.4, this Handbook, for further discussion of existing uses). However, uses requiring more stringent criteria may always be added because doing so reflects the goal of further improvement of water quality. Thus, a recreational use for wading may be deleted if a recreational use for swimming is added, or the State may add the swimming use and keep the wading use as well.

### 2.7.2 Step 2 – Is the Use Specified in Section 101(a)(2)?

If the State wishes to remove a designated use specified in section 101(a)(2) of the Act, the State must perform a use attainability analysis (see section 131.10(j)). Section 2.9 of this Handbook discusses use attainability analyses for aquatic life uses.

### 2.7.3 Step 3 – Is the Use Attainable?

A State may change activities within a specific use category but may not change to a use that requires less stringent criteria, unless the State can demonstrate that the designated use cannot be attained. (See section 2.4, above, for the definition of "attainable uses.") For example, if a State has a broad aquatic life use, EPA generally assumes that the use will support all aquatic life. The State may demonstrate that, for a specific water body, such parameters as dissolved oxygen or temperature will not support trout but will support perch when technology-based effluent limitations are applied to point source dischargers and when cost-effective and reasonable best management practices are applied to nonpoint sources.

### 2.7.4 Step 4 – Is a Factor from 131.10(g) Met?

Even after the previous steps have been considered, the designated use may be removed, or subcategories of a use established, only under the conditions given in section 131.10(g). The State must be able to demonstrate that attaining the designated use is not feasible because:

1. naturally occurring pollutant concentrations prevent the attainment of the use;
2. natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of

sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met;

3. human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;
4. dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use;
5. physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to [chemical] water quality, preclude attainment of aquatic life protection uses; or
6. controls more stringent than those required by sections 301(b)(1)(A) and (B) and 306 of the Act would result in substantial and widespread economic and social impact.

#### **2.7.5 Step 5 – Provide Public Notice**

As provided for in section 131.10(e), States must provide notice and opportunity for public hearing in accordance with section 131.20(b) (discussed in section 6.1 of this Handbook). Of course, EPA intends for States to make appropriate use of all public comments received through such notice.

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### **2.8 Revising Uses to Reflect Actual Attainment – 40 CFR 131.10(i)**

When performing its triennial review, the State must evaluate what uses are being attained. If a water body is designated for a use that requires less stringent criteria than a use that is being attained, the State must revise the use on that water body to reflect the use that is being attained.

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## 2.9 Use Attainability Analyses – 40 CFR 131.10(j) and (k)

Under section 131.10(j) of the Water Quality Standards Regulation, States are required to conduct a use attainability analysis (UAA) whenever:

- (1) the State designates or has designated uses that do not include the uses specified in section 101(a)(2) of the Act; or
- (2) the State wishes to remove a designated use that is specified in section 101(a)(2) of the Act or adopt subcategories of uses specified in section 101(a)(2) that require less stringent criteria.

States are not required to conduct UAAs when designating uses that include those specified in section 101(a)(2) of the Act, although they may conduct these or similar analyses when determining the appropriate subcategories of section 101(a)(2) goal uses.

States may also conduct generic use attainability analyses for groups of water body segments provided that the circumstances relating to the segments in question are sufficiently similar to make the results of the generic analyses reasonably applicable to each segment.

As defined in the Water Quality Standards Regulation (40 CFR 131.3), a use attainability analysis is:

. . . a structured scientific assessment of the factors affecting the attainment of a use which may include physical, chemical, biological, and economic factors as described in section 131.10(g).

### UPDATED INFORMATION

[Use Attainability Analyses](#) – This website links to facts, background materials, case studies, and helpful information on Use Attainability Analyses.

[Memo on Improving the Effectiveness of the Use Attainability Analysis Process \(2006\)](#) - This memo highlights five key points on UAA and emphasizes that designating the right uses is on the critical path to effective water quality standards implementation.

[Use Attainability Analysis Case Studies](#) – This website provides overviews of several use attainability analyses.

[Interim Economic Guidance for Water Quality Standards \(1995\)](#) – This document provides guidance for use by states and tribes in understanding the economic factors that may be considered, and the types of tests that can be used to determine if a designated use cannot be attained, if a variance can be granted, or if degradation of high-quality water is warranted.

[UAAs and Other Tools for Managing Designated Uses \(2006\) \(PDF\) \(466 pp\)](#) – This document provides access to a number of case studies, models and tools for water quality managers.



The evaluations conducted in a UAA will determine the attainable uses for a water body (see sections 2.4 and 2.8, above).

The physical, chemical, and biological factors affecting the attainment of a use are evaluated through a *water body survey and assessment*. The guidance on water body survey and assessment techniques that appears in this Handbook is for the evaluation of fish, aquatic life, and wildlife uses only (EPA has not developed guidance for assessing recreational uses). Water body surveys and assessments conducted by the States should be sufficiently detailed to answer the following questions:

- What are the aquatic use(s) currently being achieved in the water body?
- What are the causes of any impairment of the aquatic uses?
- What are the aquatic use(s) that can be attained based on the physical, chemical, and biological characteristics of the water body?

The analysis of economic factors determines whether substantial and widespread economic and social impact would be caused by pollution control requirements more stringent than (1) those required under sections 301(b)(1)(A) and (B) and section 306 of the Act for point source dischargers, and (2) cost-effective and reasonable best management practices for nonpoint source dischargers.

### 2.9.1 Water Body Survey and Assessment – Purpose and Application

The purpose of this section is to identify the physical, chemical, and biological factors that maybe examined to determine whether an aquatic life protection use is attainable for a given waterbody. The specific analyses included in this guidance are optional. However, they represent the type of analyses EPA believes are sufficient for States to justify changes in uses designated in a water quality standard and to determine uses that are attainable. States may use alternative analyses as long as they are scientifically and technically supportable. This guidance specifically addresses streams and river systems. More detailed guidance is given in the *Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volume I* (USEPA, 1983c). EPA has also developed guidance for estuarine and marine systems and lakes, which is summarized in following sections. More detailed guidance for these aquatic systems is available in the *Technical Support Manual, Volume II, Estuarine Systems*, and *Volume III, Lake Systems* (USEPA, 1984a,b).

#### UPDATED INFORMATION

##### **Integrated Report Guidance**

[Integrated Reporting \(IR\) Guidance under Sections 303\(d\), 305\(b\), and 314 of the Clean Water Act](#) – This website provides guidance for assessment, listing, and reporting of water quality conditions and includes listings of impaired waters under Section 303(d) of the CWA.

[Consolidated Assessment and Listing Methodology](#) – This document describes the methodology that streamlines reporting requirements under Sections 305(b) and 303(d) of the CWA.

##### **303(d) Listing**

[303\(d\) Listing of Impaired Waters Guidance](#) – This website provides guidance on listing impaired waters.

[Section 303\(d\) Program Guidance](#) – This website provides guidance regarding currently effective TMDL statutory and regulatory requirements and recommends a framework for EPA approval decisions on State Section 303(d) lists.

Several approaches for analyzing the aquatic life protection uses to determine if such uses are appropriate for a given water body are discussed. States are encouraged to use existing data to perform the physical, chemical, and biological evaluations presented in this guidance document. Not all of these evaluations are necessarily applicable. For example, if an assessment reveals that the physical habitat is the limiting factor precluding a use, a chemical evaluation would not be required. In addition, wherever possible, States also should consider grouping together water bodies having similar physical, chemical, and biological characteristics either to treat several water bodies or stream segments as a single unit or to establish representative conditions applicable to other similar water bodies or stream segments within a river basin. Using existing data and establishing representative conditions applicable to a number of water bodies or segments should conserve the limited resources available to the States.

Table 2-1 summarizes the types of physical, chemical, and biological factors that may be evaluated when conducting a UAA. Several approaches can be used for conducting the physical, chemical, and biological evaluations, depending on the complexity of the situation. Details on the various evaluations can be found in the *Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volume I* (USEPA, 1983c). A survey need not consider all of the parameters listed; rather, the survey should be designed on the basis of the water body characteristics and other considerations relevant to a particular survey.

These approaches may be adapted to the water body being examined. Therefore, a close working relationship between EPA and the States is essential so that EPA can assist States in determining the appropriate analyses to be used in support of any water quality standards revisions. These analyses should be made available to all interested parties before any public forums on the water quality standards to allow for full discussion of the data and analyses.

## 2.9.2 Physical Factors

Section 101(a) of the Clean Water Act recognizes the importance of preserving the physical integrity of the Nation's water bodies. Physical habitat plays an important role in the overall aquatic ecosystem and impacts the types and number of species present in a particular body of water. Physical parameters of a water body are examined to identify factors that impair the propagation and protection of aquatic life and to determine what uses could be obtained in the water body given such limitations. In general, physical parameters such as flow, temperature, water depth, velocity, substrate, reaeration rates, and other factors are used to identify any physical limitations that may preclude attainment of the designated use. Depending on the water body in question, any of the physical parameters listed in Table 2-1 may be appropriately examined. A State may use any of these parameters to identify physical limitations and characteristics of a water body. Once a State has identified any physical limitations based on evaluating the parameters listed, careful consideration of "reversibility" or the ability to restore the physical integrity of the water body should be made.

**Table 2-1. Summary of Typical Factors Used in Conducting a Water Body Survey and Assessment**  
**Physical Factors**

Physical Factors	Chemical Factors	Biological Factors
<ul style="list-style-type: none"> <li>• instream characteristics               <ul style="list-style-type: none"> <li>○ size (mean width/depth)</li> <li>○ flow velocity</li> <li>○ annual hydrology</li> <li>○ total volume</li> <li>○ reaeration rates</li> <li>○ gradient/pools/riffles</li> <li>○ temperature</li> <li>○ sedimentation</li> <li>○ channel modifications</li> <li>○ channel stability</li> </ul> </li> <li>• substrate composition and characteristics</li> <li>• channel debris</li> <li>• sludge deposits</li> <li>• riparian characteristics</li> <li>• downstream characteristics</li> </ul>	<ul style="list-style-type: none"> <li>• dissolved oxygen</li> <li>• toxicants</li> <li>• suspended solids</li> <li>• nutrients               <ul style="list-style-type: none"> <li>○ nitrogen</li> <li>○ phosphorus</li> </ul> </li> <li>• sediment oxygen</li> <li>• salinity</li> <li>• hardness</li> <li>• alkalinity</li> <li>• pH</li> <li>• dissolved solids</li> </ul>	<ul style="list-style-type: none"> <li>• biological inventory (existing use analysis)               <ul style="list-style-type: none"> <li>○ fish</li> <li>○ macroinvertebrates</li> <li>○ microinvertebrates</li> <li>○ phytoplankton</li> <li>○ periphyton</li> <li>○ macrophytes</li> </ul> </li> <li>• biological potential analysis               <ul style="list-style-type: none"> <li>○ diversity indices</li> <li>○ HIS models</li> <li>○ tissue analysis</li> <li>○ recovery index</li> <li>○ intolerant species analysis</li> <li>○ omnivore–carnivore comparison</li> </ul> </li> <li>• biological potential analysis reference reach comparison</li> </ul>

Such considerations may include whether it would cause more environmental damage to correct the problem than to leave the water body as is, or whether physical impediments such as dams can be operated or modified in a way that would allow attainment of the use.

Several assessment techniques have been developed that correlate physical habitat characteristics to fishery resources. The identification of physical factors limiting a fishery is a critical assessment that provides important data for management of the water body. The U.S. Fish and Wildlife Service has developed habitat evaluation procedures (HEP) and habitat suitability indices (HSI). Several States have begun developing their own models and procedures for habitat assessments. Parameters generally included in habitat assessment procedures are temperature, turbidity, velocity, depth, cover, pool and riffle sizes, riparian vegetation, bank stability, and siltation. These parameters are correlated to fish species by evaluating the habitat variables important to the life cycle of the species. The value of habitat for other groups of aquatic organisms such as macroinvertebrates and periphyton also may be considered. Continued research and refinement of habitat evaluation procedures reflect the importance of physical habitat.

If physical limitations of a stream restrict the use, a variety of habitat modification techniques might restore a habitat so that a species could thrive where it could not before. Some of the techniques that have been used are bank stabilization, flow control, current deflectors, check dams, artificial meanders, isolated oxbows, snag clearing when determined not to be detrimental to the life cycle or reproduction of a species, and installation of spawning beds and artificial spawning channels. If the habitat is a limiting factor to the propagation and/or survival of aquatic life, the feasibility of modifications might be examined before additional controls are imposed on dischargers.

### 2.9.3 Chemical Evaluations

The chemical characteristics of a water body are examined to determine why a designated use is not being met and to determine the potential of a particular species to survive in the water body if the concentration of particular chemicals were modified. The State has the discretion to determine the parameters required to perform an adequate water chemistry evaluation. A partial list of the parameters that may be evaluated is provided in Table 2-1.

As part of the evaluation of the water chemistry composition, a natural background evaluation is useful in determining the relative contribution of natural background contaminants to the water body; this may be a legitimate factor that effectively prevents a designated use from being met. To determine whether the natural background concentration of a pollutant is adversely impacting the survival of species, the concentration may be compared to one of the following:

- 304(a) criteria guidance documents; or
- site-specific criteria; or
- State-derived criteria.

Another way to obtain an indication of the potential for the species to survive is to determine if the species are found in other waterways with similar chemical concentrations.

In determining whether human-caused pollution is irreversible, consideration needs to be given to the permanence of the damage, the feasibility of abating the pollution, or the additional environmental damage that may result from removing the pollutants. Once a State identifies the chemical or water quality characteristics that are limiting attainment of the use, differing levels of remedial control measures may be explored. In addition, if instream toxicants cannot be removed by natural processes and cannot be removed by human effort without severe long-term environmental impacts, the pollution may be considered irreversible.

In some areas, the water's chemical characteristics may have to be calculated using predictive water quality models. This will be true if the receiving water is to be impacted by new dischargers, changes in land use, or improved treatment facilities. Guidance is available on the selection and use of receiving water models for biochemical oxygen demand, dissolved oxygen, and ammonia for instream systems (USEPA, 1983d,e) and dissolved oxygen, nitrogen, and phosphorus for lake systems, reservoirs, and impoundments (USEPA, 1983f).

## 2.9.4 Biological Evaluations

### UPDATED INFORMATION

In evaluating what aquatic life protection uses are attainable, the biology of the water body should be evaluated. The interrelationships between the physical, chemical, and biological characteristics are complex, and alterations in the physical and/or chemical parameters result in biological changes.

[Primer on Using Biological Assessments to Support Water Quality Management \(2011\) \(PDF\) \(107 pp, 6.9MB\)](#) - See page 39 for an example of the use of biological assessments to support Use Attainability Analysis in Ohio.

The biological evaluation described in this section encourages States to:

- provide a more precise statement of which species exist in the water body and should be protected;
- determine the biological health of the water body; and
- determine the species that could potentially exist in the water body if the physical and chemical factors impairing a use were corrected.

This section of the guidance will present the conceptual framework for making these evaluations. States have the discretion to use other scientifically and technically supportable assessment methodologies deemed appropriate for specific water bodies on a case-by-case basis. Further details on each of the analyses presented can be found in the *Technical Support Manual for Conducting Use Attainability Analyses* (USEPA, 1983c).

### ***Biological Inventory (Existing Use Analysis)***

The identification of which species are in the water body and should be protected serves several purposes:

- By knowing what species are present, the biologist can analyze, in general terms, the health of the water body. For example, if the fish species present are principally carnivores, the quality of the water is generally higher than in a water body dominated by omnivores. It also allows the biologist to assess the presence or absence of intolerant species.
- Identification of the species enables the State to develop baseline conditions against which to evaluate any remedial actions. The development of a regional baseline based upon several site-specific species lists increases an understanding of the regional fauna. This allows for easier grouping of water bodies based on the biological regime of the area.
- By identifying the species, the decision-maker has the data needed to explain the present condition of the water body to the public and the uses that must be maintained.

The evaluation of the existing biota may be simple or complex depending on data availability. As much information as possible should be gathered on the categories of organisms listed in Table 2-1. It is not necessary to obtain complete data for all six categories. However, it is recommended that fish should be included in any combination of categories chosen because:

- the general public can relate better to statements about the condition of the fish community;

- fish are typically present even in the smallest streams and in all but the most polluted waters;
- fish are relatively easy to identify, and samples can be sorted and identified at the field site;
- life–history information is extensive for many fish species so that stress effects can be evaluated (Karr, 1981). In addition, since fish are mobile, States are encouraged to evaluate other categories of organisms.

Before any field work is conducted, existing data should be collected. EPA can provide data from intensive monitoring surveys and special studies. Data, especially for fish, may be available from State fish and game departments, recreation agencies, and local governments, or through environmental impact statements, permit reviews, surveys, and university or other studies.

### ***Biological Condition/Biological Health Assessment***

The biological inventory can be used to gain insight into the biological health of the water body by evaluating:

- species richness or the number of species;
- presence of intolerant species;
- proportion of omnivores and carnivores;
- biomass or production; and
- number of individuals per species.

The role of the biologist becomes critical in evaluating the health of the biota because the knowledge of expected richness or expected species comes only from understanding the general biological traits and regimes of the area. Best professional judgments by local biologists are important. These judgments are based on many years of experience and on observations of the physical and chemical changes that have occurred over time.

Many methods for evaluating biotic communities have been and continue to be developed. The *Technical Support Manual for Conducting Use Attainability Analyses* (USEPA, 1983c) and *Rapid Bioassessment Protocols for Use in Streams and Rivers* (USEPA, 1989e) describe methods that States may want to consider using in their biological evaluations.

A number of other methods have been and are being developed to evaluate the health of biological components of the aquatic ecosystem including short–term *in situ* or laboratory bioassays and partial or full life–cycle toxicity tests. These methods are discussed in several EPA publications, including the *Biological Methods Manual* (USEPA, 1972). Again, it is not the intent of this document to specify tests to be conducted by the States. This will depend on the information available, the predictive accuracy required, site–specific conditions of the water body being examined, and the cooperation and assistance the State receives from the affected municipalities and industries.

## ***Biological Potential Analysis***

A significant step in the use attainability analysis is the evaluation of what communities could potentially exist in a particular water body if pollution were abated or if the physical habitat were modified. The approach presented is to compare the water body in question to reference reaches within a region. This approach includes the development of baseline conditions to facilitate the comparison of several water bodies at less cost. As with the other analyses mentioned previously, available data should be used to minimize resource impacts.

The biological potential analysis involves:

- defining boundaries of fish faunal regions;
- selecting control sampling sites in the reference reaches of each area;
- sampling fish and recording observations at each reference sampling site;
- establishing the community characteristics for the reference reaches of each area; and
- comparing the water body in question to the reference reaches.

In establishing faunal regions and sites, it is important to select reference areas for sampling sites that have conditions typical of the region.

The establishment of reference areas may be based on physical and hydrological characteristics. The number of reference reaches needed will be determined by the State depending on the variability of the waterways within the State and the number of classes that the State may wish to establish. For example, the State may want to use size, flow, and substrate as the defining characteristics and may consequently desire to establish classes such as small, fast running streams with sandy substrate or large, slow rivers with cobble bottom. It is at the option of the State to:

- choose the parameters to be used in classifying and establishing reference reaches; and
- determine the number of classes (and thus the refinement) within the faunal region.

This approach can also be applied to other aquatic organisms such as macroinvertebrates (particularly freshwater mussels) and algae.

Selection of the reference reaches is of critical importance because the characteristics of the aquatic community will be used to establish baseline conditions against which similar reaches (based on physical and hydrological characteristics) are compared. Once the reference reaches are established, the water body in question can be compared to the reference reach. The results of this analysis will reveal whether the water body in question has the typical biota for that class or a less desirable community and will provide an indication of what species may potentially exist if pollution were abated or the physical habitat limitations were remedied.

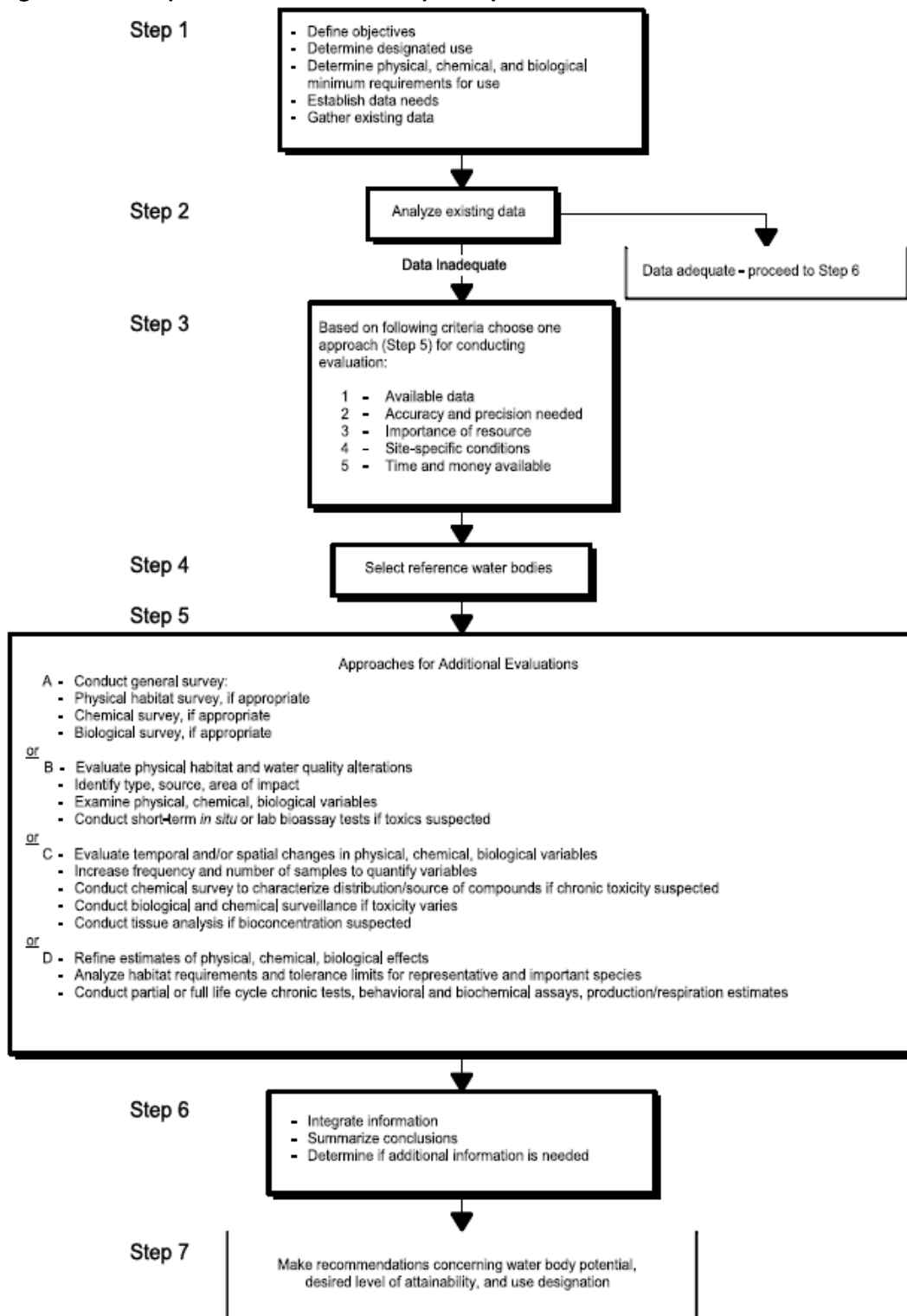
### **2.9.5 Approaches to Conducting the Physical, Chemical, and Biological Evaluations**

In some cases, States that assess the status of their aquatic resources, will have relatively simple situations not requiring extensive data collection and evaluation. In other situations, however, the complexity resulting from variable environmental conditions and the stress from multiple uses of the resource will require both intensive and extensive studies to produce a sound evaluation of the system. Thus, procedures that a State may develop for conducting a water body assessment should be flexible enough to be adaptable to a variety of site-specific conditions.

A common experimental approach used in biological assessments has been a hierarchical approach to the analyses. This can be a rigidly tiered approach. An alternative is presented in Figure 2-2.



Figure 2–2. Steps in a Use Attainability Analysis



The flow chart is a general illustration of a thought process used to conduct a use attainability analysis. The process illustrates several alternative approaches that can be pursued separately or, to varying degrees, simultaneously depending on:

- the amount of data available on the site;
- the degree of accuracy and precision required;
- the importance of the resource;
- the site-specific conditions of the study area; and
- the controversy associated with the site.

The degree of sophistication is variable for each approach. Emphasis is placed on evaluating available data first. If information is found to be lacking or incomplete, then field testing or field surveys should be conducted.

The major elements of the process are briefly described below.

### ***Steps 1 and 2***

Steps 1 and 2 are the basic organizing steps in the evaluation process. By carefully defining the objectives and scope of the evaluation, there will be some indication of the level of sophistication required in subsequent surveys and testing. States and the regulated community can then adequately plan and allocate resources to the analyses. The designated use of the water body in question should be identified as well as the minimum chemical, physical, and biological requirements for maintaining the use. Minimum requirements may include, for example, dissolved oxygen levels, flow rates, temperature, and other factors. All relevant information on the waterbody should be collected to determine if the available information is adequate for conducting an appropriate level of analysis. It is assumed that all water body evaluations, based on existing data, will either formally or informally be conducted through Steps 1 and 2.

### ***Steps 3 and 4***

If the available information proves inadequate, then decisions regarding the degree of sophistication required in the evaluation process will need to be made. These decisions will, most likely, be based on the five criteria listed in Step 3 of Figure 2-2. Based on these decisions, reference areas should be chosen (Step 4), and one or more of the testing approaches should be followed.

### ***Steps 5A, B, C, D***

These approaches are presented to illustrate several possible ways of analyzing the water body. For example, in some cases chemical data may be readily available for a water body but little or no biological information is known. In this case, extensive chemical sampling may not be required, but enough samples should be taken to confirm the accuracy of the available data set. Thus, to accurately define the biological condition of the resource, 5C may be chosen, but 5A may be pursued in a less intensive way to supplement the chemical data already available.

Step 5A is a general survey to establish relatively coarse ranges for physical and chemical variables, and the numbers and relative abundances of the biological components (fishes, invertebrates, primary producers) in the water body. Reference areas may or may not need to be evaluated here, depending on the types of questions being asked and the degree of accuracy required.

Step 5B focuses more narrowly on site-specific problem areas with the intent of separating, where possible, biological impacts due to physical habitat alteration versus those due to chemical impacts. These categories are not mutually exclusive but some attempt should be made to define the causal factors in a stressed area so that appropriate control measures can be implemented if necessary.

Step 5C would be conducted to evaluate possibly important trends in the spatial and/or temporal changes associated with the physical, chemical, and biological variables of interest. In general, more rigorous quantification of these variables would be needed to allow for more sophisticated statistical analyses between reference and study areas which would, in turn, increase the degree of accuracy and confidence in the predictions based on this evaluation. Additional laboratory testing may be included, such as tissue analyses, behavioral tests, algal assays, or tests for flesh tainting. Also, high-level chemical analyses may be needed, particularly if the presence of toxic compounds is suspected.

Step 5D is, in some respects, the most detailed level of study. Emphasis is placed on refining cause-effect relationships between physical-chemical alterations and the biological responses previously established from available data or steps 5A through 5C. In many cases, state-of-the-art techniques will be used. This pathway would be conducted by the States only where it may be necessary to establish, with a high degree of confidence, the cause-effect relationships that are producing the biological community characteristics of those areas. Habitat requirements or tolerance limits for representative or important species may have to be determined for those factors limiting the potential of the ecosystem. For these evaluations, partial or full life-cycle toxicity tests, algal assays, and sediment bioassays may be needed along with the shorter term bioassays designed to elucidate sublethal effects not readily apparent in toxicity tests (e.g., preference-avoidance responses, production-respiration estimates, and bioconcentration estimates).

The CWA indicates that all of its programs protect waters of the United States, and as a result, there is only one definition for that key threshold term. Thus, the EPA has not defined waters of the United States separately for WQS but, instead, relies on the established definitions, interpretations, and decisions described above in administering the WQS program.

States and tribes may choose to expand their coverage of WQS beyond waters of the United States to include other waters as "waters of the state." For example, a state or tribe may specifically designate isolated wetlands (that do not meet the definition of waters of the United States) as waters to which state and tribal WQS apply.

## ***Steps 6 and 7***

After field sampling is completed, all data must be integrated and summarized. If this information is still not adequate, then further testing may be required and a more detailed pathway chosen. With adequate data, States should be able to make reasonably specific recommendations concerning the natural potential of the water body, levels of attainability consistent with this potential, and appropriate use designations. The evaluation procedure outlined here allows States a significant degree of latitude for designing assessments to meet their specific goals in water quality and water use.

### **2.9.6 Estuarine Systems**

This section provides an overview of the factors that should be considered in developing use attainability analyses for estuaries. Anyone planning to conduct a use attainability analysis for an estuary should consult the *Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volume II: Estuarine Systems* (USEPA, 1984a) for more detailed guidance. Also, much of the information for streams and rivers that is presented above and in Volume I of the Technical Support Manual, particularly with respect to chemical evaluations, will apply to estuaries and is not repeated here.

The term "estuaries" is generally used to denote the lower reaches of a river where tide and river flows interact. Estuaries are very complex receiving waters that are highly variable in description and are not absolutes in definition, size, shape, aquatic life, or other attributes. Physical, chemical, and biological attributes may require consideration unique to estuaries and are discussed below.

#### ***Physical Processes***

Estuarine flows are the result of a complex interaction of the following physical factors:  
tides;

- wind shear;
- freshwater inflow (momentum and buoyancy);
- topographic frictional resistance;
- Coriolis effect;
- vertical mixing; and
- horizontal mixing.

In performing a use attainability study, one may simplify the complex prototype system by determining which of these effects or combination of effects is most important at the time scale of the evaluation (days, months, seasons, etc.).

Other ways to simplify the approach to analyzing an estuary is to place it in a broad classification system to permit comparison of similar types of estuaries. The most common groupings are based on geomorphology, stratification, circulation patterns, and time scales. Each of these groupings is discussed below.

Geomorphological classifications can include types such as drowned river valleys (coastal plain estuaries), fjords, bar-built estuaries, and other estuaries that do not fit the first three classifications (those produced by tectonic activity, faulting, landslides, or volcanic eruptions).

Stratification is most often used for classifying estuaries influenced by tides and freshwater inflows. Generally, highly stratified estuaries have large river discharges flowing into them, partially mixed estuaries have medium river discharges; and vertically homogeneous have small river discharges.

Circulation in an estuary (i.e., the velocity patterns as they change over time) is primarily affected by the freshwater outflow, the tidal inflow, and the effect of wind. In turn, the difference in density between outflow and inflow sets up secondary currents that ultimately affect the salinity distribution across the estuary. The salinity distribution is important because it affects the distribution of fauna and flora within the estuary. It is also important because it is indicative of the mixing properties of the estuary as they may affect the dispersion of pollutants (flushing properties). Additional factors such as friction forces and the size and geometry of the estuary also contribute to the circulation patterns. The complex geometry of estuaries, in combination with the presence of wind, the effect of the Earth's rotation (Coriolis effect), and other effects, often results in residual currents (i.e., of longer period than the tidal cycle) that strongly influence the mixing processes in estuaries.

Consideration of time scales of the physical processes being evaluated is very important for any water quality study.

Short-term conditions are much more influenced by a variety of short-term events that perhaps have to be analyzed to evaluate a "worst case" scenario. Longer term (seasonal) conditions are influenced predominantly by events that are averaged over the duration of that time scale.

### ***Estuary Substrate Composition***

Characterization of sediment/substrate properties is important in a use attainability analysis because such properties:

- determine the extent to which toxic compounds in sediments are available to the biota; and
- determine what types of plants and animals could potentially become established, assuming no interference from other factors such as nutrient, dissolved oxygen (DO), and/or toxics problems.

The bottom of most estuaries is a mix of sand, silt, and mud that has been transported and deposited by ocean currents or by freshwater sources. Rocky areas may also be present, particularly in the fjord-type estuary. None of these substrate types is particularly hospitable to aquatic plants and animals, which accounts in part for the paucity of species seen in an estuary.

The amount of material transported to the estuary will be determined by the types of terrain through which the river passes, and upon land use practices that may encourage runoff and erosion. It is important to take land use practices into consideration when examining the attainable uses of the estuary. Deposition of particles varies with location in the estuaries and velocity of the currents.

It is often difficult for plants to colonize estuaries because of a lack of suitable anchorage points and because of the turbidity of the water, which restricts light penetration (McLusky, 1971). Submerged aquatic vegetation (SAV) (macrophytes) develops in sheltered areas where silt and mud accumulate. These plants help to slow the currents, leading to further deposition of silt. The growth of plants often keeps pace with rising sediment levels so that over a long period of time substantial deposits of sediment and plant material may be seen.

SAV serves very important roles as habitat and as a food source for much of the biota of the estuary. Major estuary studies have shown that the health of SAV communities serves as an important indicator of estuary health.

### ***Adjacent Wetlands***

Tidal and freshwater wetlands adjacent to the estuary can serve as a buffer to protect the estuary from external phenomena. This function may be particularly important during wet weather periods when relatively high stream flows discharge high loads of sediment and pollutants to the estuary. The wetlands slow the peak velocity, to some extent alleviate the sudden shock of salinity changes, and filter some of the sediments and nutrients that would otherwise be discharged directly into the estuary.

### ***Hydrology and Hydraulics***

The two most important sources of freshwater to the estuary are stream flow and precipitation. Stream flow generally represents the greatest contribution to the estuary. The location of the salinity gradient in a river-controlled estuary is to a large extent a function of stream flow. Location of the iso-concentration lines may change considerably, depending upon whether stream flow is high or low. This in turn may affect the biology of the estuary, resulting in population shifts as biological species adjust to changes in salinity. Most estuarine species are adapted to survive temporary changes in salinity either by migration or some other mechanism (e.g., mussels can close their shells). However, many cannot withstand these changes indefinitely. Response of an estuary to rainfall events depends upon the intensity of rainfall, the drainage area affected by the rainfall, and the size of the estuary. Movement of the salt front is dependent upon tidal influences and freshwater flow to the estuary. Variations in salinity generally follow seasonal patterns such that the salt front will occur farther down-estuary during a rainy season than during a dry season. The salinity profile also may vary from day to day, reflecting the effect of individual rainfall events, and may undergo major changes due to extreme meteorological events.

Anthropogenic activity also may have a significant effect on salinity in an estuary. When feeder streams are used as sources of public water supply and the withdrawals are not returned, freshwater flow to the estuary is reduced, and the salt wedge is found farther up the estuary. If the water is

returned, usually in the form of wastewater effluent, the salinity gradient of the estuary may not be affected, although other problems attributable to nutrients and other pollutants in the wastewater may occur.

Salinity also may be affected by the way that dams along the river are operated. Flood control dams result in controlled discharges to the estuary rather than relatively short but massive discharge during high-flow periods. Dams operated to impound water for water supplies during low-flow periods may drastically alter the pattern of freshwater flow to the estuary, and although the annual discharge may remain the same, seasonal changes may have significant impact on the estuary and its biota.

### ***Influence of Physical Characteristics on Use Attainability***

"Segmentation" of an estuary can provide a useful framework for evaluating the influence of estuarine physical characteristics such as circulation, mixing, salinity, and geomorphology on use attainability. Segmentation is the compartmentalization of an estuary into subunits with homogeneous physical characteristics. In the absence of water pollution, physical characteristics of different regions of the estuary tend to govern the suitability for major water uses. Once the segment network is established, each segment can be subjected to a use attainability analysis. In addition, the segmentation process offers a useful management structure for monitoring conformance with water quality goals in future years.

The segmentation process is an evaluation tool that recognizes that an estuary is an interrelated ecosystem composed of chemically, physically, and biologically diverse areas. It assumes that an ecosystem as diverse as an estuary cannot be effectively managed as only one unit because different uses and associated water quality goals will be appropriate and feasible for different regions of the estuary. However, after developing a network based upon physical characteristics, sediment boundaries can be refined with available chemical and biological data to maximize the homogeneity of each segment.

A potential source of concern about the construction and utility of the segmentation scheme for use attainability evaluations is that the estuary is a fluid system with only a few obvious boundaries, such as the sea surface and the sediment-water interface. Fixed boundaries may seem unnatural to scientists, managers, and users, who are more likely to view the estuary as a continuum than as a system composed of separable parts. The best approach to dealing with such concerns is a segmentation scheme that stresses the dynamic nature of the estuary. The scheme should emphasize that the segment boundaries are operationally defined constructs to assist in understanding a changeable, intercommunicating system of channels, embayments, and tributaries.

To account for the dynamic nature of the estuary, it is recommended that estuarine circulation patterns be a prominent factor in delineating the segment network. Circulation patterns control the transport of and residence times for heat, salinity, phytoplankton, nutrients, sediment, and other pollutants throughout the estuary. Salinity should be another important factor in delineating the segment network. The variations in salinity concentrations from head of tide to the mouth typically produce a separation of biological communities based on salinity tolerances or preferences.

## *Chemical Parameters*

The most critical chemical water quality indicators for aquatic use attainment in an estuary are dissolved oxygen, nutrients and chlorophyll-a, and toxicants. Dissolved oxygen (DO) is an important water quality indicator for all fisheries uses. In evaluating use attainability, assessments of DO impacts should consider the relative contributions of three different sources of oxygen demand:

- photosynthesis/respiration demand from phytoplankton;
- water column demand; and
- benthic oxygen demand.

If use impairment is occurring, assessments of the significance of each oxygen sink can be used to evaluate the feasibility of achieving sufficient pollution control to attain the designated use.

Chlorophyll-a is the most popular indicator of algal concentrations and nutrient overenrichment, which in turn can be related to diurnal DO depressions due to algal respiration. Typically, the control of phosphorus levels can limit algal growth near the head of the estuary, while the control of nitrogen levels can limit algal growth near the mouth of the estuary; however, these relationships are dependent upon factors such as nitrogen phosphorus ("N/P") ratios and light penetration potential, which can vary from one estuary to the next. Excessive phytoplankton concentrations, as indicated by chlorophyll-a levels, can cause adverse DO impacts such as:

- wide diurnal variations in surface DO due to daytime photosynthetic oxygen production and nighttime oxygen depletion by respiration; and
- depletion of bottom DO through the decomposition of dead algae.

Excessive chlorophyll-a levels also result in shading, which reduces light penetration for submerged aquatic vegetation (SAV). Consequently, the prevention of nutrient over-enrichment is probably the most important water quality requirement for a healthy SAV community.

The nutrients of greatest concern in the estuary are nitrogen and phosphorus. Their sources typically are discharges from sewage treatment plants and industries and runoff from urban and agricultural areas. Increased nutrient levels lead to phytoplankton blooms and a subsequent reduction in DO levels and light penetration, as discussed above.

Sewage treatment plants are typically the major source of nutrients, particularly phosphorus, to estuaries in urban areas. Agricultural land uses and urban land uses represent significant nonpoint sources of nutrients, particularly nitrogen. It is important to base control strategies on an understanding of the sources of each type of nutrient, both in the estuary and in its feeder streams.

Point sources of nutrients are typically much more amenable to control than nonpoint sources. Because phosphorus removal for municipal wastewater discharges is typically less expensive than nitrogen removal operations, the control of phosphorus discharges is often the method of choice for



the prevention or reversal of use impairment in the upper estuary (i.e., tidal fresh zone). However, nutrient control in the upper reaches of the estuary may cause algal blooms in the lower reaches, e.g., control of phosphorus in the upper reaches may reduce the algal blooms there, but in doing so also increase the amount of nitrogen transported to the lower reaches where nitrogen is the limiting nutrient causing a bloom there. Tradeoffs between nutrient controls for the upper and lower estuary should be considered in evaluating measures for prevention of reversing use impairment.

Potential interferences from toxic substances, such as pesticides, herbicides, heavy metals, and chlorinated effluents, also need to be considered in a use attainability study. The presence of certain toxicants in excessive concentrations within bottom sediments of the water column may prevent the attainment of water uses (particularly fisheries propagation/harvesting and sea grass habitat uses) in estuary segments that satisfy water quality criteria for DO, chlorophyll-a/nutrient enrichment, and fecal coliform.

### ***Biological Community Characteristics***

The *Technical Support Manual, Volume II* (USEPA, 1984a) provides a discussion of the organisms typically found in estuaries in more detail than is appropriate for this Handbook. Therefore, this discussion will focus on more general characteristics of estuarine biota and their adaptations to accommodate a fluctuating environment.

Salinity, light penetration, and substrate composition are the most critical factors to the distribution and survival of plant and animal communities in an estuary. The estuarine environment is characterized by variations in circulation, salinity, temperature, and dissolved oxygen supply. Colonizing plants and animals must be able to withstand the fluctuating conditions in estuaries.

The depth to which attached plants may become established is limited by turbidity because plants require light for photosynthesis. Estuaries are typically turbid because of large quantities of detritus and silt contributed by surrounding marshes and rivers. Algal growth also may hinder light penetration. If too much light is withheld from the lower depths, animals cannot rely heavily on visual cues for habitat selection, feeding, or finding a mate.

Estuarine organisms are recruited from the sea, freshwater environments, and the land. The major environmental factors to which organisms must adjust are periodic submersion and desiccation as well as fluctuating salinity, temperature, and dissolved oxygen.

Several generalizations concerning the responses of estuarine organisms to salinity have been noted (Vernberg, 1983) and reflect a correlation of an organism's habitat to its tolerance:

- organisms living in estuaries subjected to wide salinity fluctuations can withstand a wider range of salinities than species that occur in high-salinity estuaries;
- intertidal zone animals tend to tolerate wider ranges of salinities than do subtidal and open-ocean organisms;
- low intertidal species are less tolerant of low salinities than are high intertidal species; and
- more sessile animals are likely to be more tolerant of fluctuating salinities than organisms that are highly mobile and capable of migrating during times of salinity stress.

Estuaries are generally characterized by low diversity of species but high productivity because they serve as the nursery or breeding grounds for some species. Methods to measure the biological health and diversity of estuaries are discussed in USEPA (1984a).

### ***Techniques for Use Attainability Evaluations***

In assessing use levels for aquatic life protection, determination of the present use and whether this corresponds to the designated use is evaluated in terms of biological measurements and indices. However, if the present use does not correspond to the designated use, physical and chemical factors are used to explain the lack of attainment and the highest level the system can achieve.

The physical and chemical evaluations may proceed on several levels depending on the level of detail required, amount of knowledge available about the system (and similar systems), and budget for the use attainability study. As a first step, the estuary is classified in terms of physical processes so that it can be compared with reference estuaries in terms of differences in water quality and biological communities, which can be related to man-made alteration (i.e., pollution discharges).

The second step is to perform desktop or simple computer model calculations to improve the understanding of spatial and temporal water quality conditions in the present system. These calculations include continuous point source and simple box model-type calculations. A more detailed discussion of the desktop and computer calculations is given in USEPA (1984a).

The third step is to perform detailed analyses through the use of more sophisticated computer models. These tools can be used to evaluate the system's response to removing individual point and nonpoint source discharges, so as to assist with assessments of the cause(s) of any use impairment.

### **2.9.7 Lake Systems**

This section will focus on the factors that should be considered in performing use attainability analyses for lake systems. Lake systems are in most cases linked physically to rivers and streams and exhibit a transition from riverine habitat and conditions to lacustrine habitat and conditions. Therefore, the information presented in section 2.9.1 through 2.9.5 and the *Technical Support Manual, Volume I* (USEPA, 1983c) will to some extent apply to lake systems. EPA has provided guidance specific to lake systems in the *Technical Support Manual for Conducting Use Attainability Analyses, Volume III: Lake Systems* (USEPA, 1984b). This manual should be consulted by anyone performing a use attainability analysis for lake systems.

Aquatic life uses of a lake are defined in reference to the plant and animal life in a lake. However, the types and abundance of the biota are largely determined by the physical and chemical characteristics of the lake. Other contributing factors include the location, climatological conditions, and historical events affecting the lake.

## ***Physical Parameters***

The physical parameters that describe the size, shape, and flow regime of a lake represent the basic characteristics that affect physical, chemical, and biological processes. As part of a use attainability analysis, the physical parameters must be examined to understand non-water quality factors that affect the lake's aquatic life.

The origins of a lake determine its morphologic characteristics and strongly influence the physical, chemical, and biological conditions that will prevail. Therefore, grouping lakes formed by the same process often will allow comparison of similar lake systems. Measurement of the following morphological characteristics may be of importance to a water body survey:

- surface area;
- volume;
- inflow and outflow;
- mean depth;
- maximum depth;
- length; length of shoreline;
- depth-area relationships;
- depth-volume relationships; and
- bathymetry (submerged contours).

These physical parameters can in some cases be used to predict biological parameters. For example, mean depth has been used as an indicator of productivity. Shallow lakes tend to be more productive, and deep, steep-sided lakes tend to be less productive. These parameters may also be used to calculate other characteristics of the lake such as mass flow rate of a chemical, surface loading rate, and detention time.

Total lake volume and inflow and outflow rates are physical characteristics that indirectly affect the lake's aquatic community. Large inflows and outflows for lakes with small volumes produce low detention times or high flow-through rates. Aquatic life under these conditions may be different than when relatively small inflows and outflows occur for a large-volume lake where long detention times occur.

The shape factor (lake length divided by lake width) also may be correlated to chemical and biological characteristics. This factor has been used to predict parameters such as chlorophyll-a levels in lakes. For more detailed lake analysis, information describing the depth-area and depth-volume relationships and information describing the bathymetry may be required.

In addition to the physical parameters listed above, it is also important to obtain and analyze information concerning the lake's contributing watershed. Two major parameters of concern are the drainage area of the contributing watershed and the land uses of that watershed. Drainage area will aid in the analysis of inflow volumes to the lake due to surface runoff. The land use classification of the area around the lake can be used to predict flows and also nonpoint source pollutant loadings to

the lake.

The physical parameters discussed above may be used to understand and analyze the various physical processes that occur in lakes. They can also be used directly in simplistic relationships that predict productivity to aid in aquatic use attainability analyses.

### ***Physical Processes***

Many complex and interrelated physical processes occur in lakes. These processes are highly dependent on the lake's physical parameters, location, and characteristics of the contributing watershed. Several of the major processes are discussed below.

#### ***Lake Currents***

Water movement in a lake affects productivity and the biota because it influences the distribution of nutrients, microorganisms, and plankton. Lake currents are propagated by wind, inflow/outflow, and the Coriolis force. For small shallow lakes, particularly long and narrow lakes, inflow/outflow characteristics are most important, and the predominant current is a steady-state flow through the lake. For very large lakes, wind is the primary generator of currents, and except for local effects, inflow/outflow have a relatively minor effect on lake circulation. Coriolis effect, a deflecting force that is the function of the Earth's rotation, also plays a role in circulation in large lakes such as the Great Lakes.

#### ***Heat Budget***

Temperature and its distribution within lakes and reservoirs affects not only the water quality within the lake but also the thermal regime and quality of a river system downstream of the lake. The thermal regime of a lake is a function of the heat balance around the body of water. Heat transfer modes into and out of the lake include heat transfer through the air-water interface, conduction through the mud-water interface, and inflow and outflow heat advection.

Heat transfer through the air-water interface is primarily responsible for typical annual temperature cycles. Heat is transferred across the air-water interface by three different processes: radiation exchange, evaporation, and conduction. The heat flux of the air-water interface is a function of location (latitude/longitude and elevation), season, time of day, and meteorological conditions (cloud cover, dew-point, temperature, barometric pressure, and wind).

#### ***Light Penetration***

Transmission of light through the water column influences primary productivity (phytoplankton and macrophytes), distribution of organisms, and behavior of fish. The reduction of light through the water column of a lake is a function of scattering and absorption. Light transmission is affected by the water surface film, floatable and suspended particulates, turbidity, dense populations of algae and bacteria, and color.

An important parameter based on the transmission of light is the depth to which photosynthetic activity is possible. The minimum light intensity required for photosynthesis has been established to be about 1.0 percent of the incident surface light (Cole, 1979). The portion of the lake from the surface to the depth at which the 1.0 percent intensity occurs is referred to as the "euphotic zone."

### ***Lake Stratification***

Lakes in temperate and northern latitudes typically exhibit vertical density stratification during certain seasons of the year. Stratification in lakes is primarily due to temperature differences, although salinity and suspended solids concentrations may also affect density. Typically, three zones of thermal stratification are formed.

The upper layer of warmer, lower density water is termed the "epilimnion," and the lower, stagnant layer of colder, higher density water is termed the "hypolimnion." The transition zone between the epilimnion and the hypolimnion, referred to as the "metalimnion," is characterized by the maximum rate of temperature decline with depth (the thermocline). During stratification, the presence of the thermocline suppresses many of the mass transport phenomena that are otherwise responsible for the vertical transport of water quality constituents within a lake. The aquatic community present in a lake is highly dependent on the thermal structure.

With respect to internal flow structure, three distinct classes of lakes are defined:

- strongly stratified, deep lakes characterized by horizontal isotherms;
- weakly stratified lakes characterized by isotherms that are tilted along the longitudinal axis of the reservoir; and
- non-stratified, completely mixed lakes characterized by isotherms that are essentially vertical.

Retardation of mass transport between the hypolimnion and the epilimnion results in sharply differentiated water quality and biology between the lake strata.

One of the most important differences between the layers is often dissolved oxygen. As this is depleted from the hypolimnion without being replenished, life functions of many organisms are impaired, and the biology and biologically mediated reactions fundamental to water quality are altered.

Vertical stratification of a lake with respect to nutrients can also occur. Dissolved nutrients are converted to particulate organic material through photosynthetic processes in the epilimnion in ecologically advanced lakes. This assimilation lowers the ambient nutrient concentrations in the epilimnion. When the algae die and sink to the bottom, nutrients are carried to the hypolimnion where they are released by decomposition.

Temperature also has a direct effect on biology of a lake because most biological processes (e.g., growth, respiration, reproduction, migration, mortality, and decay) are strongly influenced by ambient temperature.

### ***Annual Circulation Pattern and Lake Classification***

Lakes can be classified on the basis of their pattern of annual mixing. These classifications are described below.

1. Amictic – Lakes that never circulate and are permanently covered with ice, primarily in the Antarctic and very high mountains.
2. Holomictic – Lakes that mix from top to bottom as a result of wind-driven circulation. Several subcategories are defined:
  - Oligomictic – Lakes characterized by circulation that is unusual, irregular, and short in duration; generally small to medium tropical lakes or very deep lakes.
  - Monomictic – Lakes that undergo one regular circulation per year.
  - Dimictic – Lakes that circulate twice a year, in spring and fall, one of the most common types of annual mixing in cool temperate regions such as central and eastern North America.
  - Polymictic – Lakes that circulate frequently or continuously, cold lakes that are continually near or slightly above 4°C, or warm equatorial lakes where air temperature changes very little.
3. Meromictic – Lakes that do not circulate throughout the entire water column. The lower water stratum is perennially stagnant.

### ***Lake Sedimentation***

Deposition of sediment received from the surrounding watershed is an important physical process in lakes. Because of the low water velocities through the lake or reservoir, sediments transported by inflowing waters tend to settle out.

Sediment accumulation rates are strongly dependent both on the physiographic characteristics of a specific watershed and on various characteristics of the lake. Prediction of sedimentation rates can be estimated in two basic ways:

- periodic sediment surveys on a lake; and
- estimation of watershed erosion and bed load.

Accumulation of sediment in lakes can, over many years, reduce the life of the water body by reducing the water storage capacity. Sediment flow into the lake also reduces light penetration, eliminates bottom habitat for many plants and animals, and carries with it adsorbed chemicals and organic matter that settle to the bottom and can be harmful to the ecology of the lake. Where sediment accumulation is a major problem, proper watershed management including erosion and sediment control must be put into effect

### ***Chemical Characteristics***

Freshwater chemistry is discussed in section 2.9.3 and in the *Technical Support Manual, Volume I* (USEPA, 1983c). Therefore, the discussion here will focus on chemical phenomena that are of particular importance to lakes. Nutrient cycling and eutrophication are the primary factors of concern in this discussion, but the effects of pH, dissolved oxygen, and redox potential on lake processes are also involved.

Water chemistry in a lake is closely related to the stages in the annual lake turnover. Once a thermocline has formed, the dissolved oxygen levels in the hypolimnion tend to decline. This occurs because the hypolimnion is isolated from surface waters by the thermocline and there is no mechanism for aeration.

The decay of organic matter and the respiration of fish and other organisms in the hypolimnion serve to deplete DO. Extreme depletion of DO may occur in ice- and snow-covered lakes in which light is insufficient for photosynthesis. If depletion of DO is great enough, fish kills may result. With the depletion of DO, reducing conditions prevail and many compounds that have accumulated in the sediment by precipitation are released to the surrounding water. Chemicals solubilized under such conditions include compounds of nitrogen, phosphorus, iron, manganese, and calcium. Phosphorus and nitrogen are of particular concern because of their role in the eutrophication process in lakes.

Nutrients released from the bottom sediments during stratified conditions are not available to phytoplankton in the epilimnion. However, during overturn periods, mixing of the layers distributes the nutrients throughout the water column. The high nutrient availability is short-lived because the soluble reduced forms are rapidly oxidized to insoluble forms that precipitate out and settle to the bottom. Phosphorus and nitrogen are also deposited through sorption to particles that settle to the bottom and as dead plant material that is added to the sediments.

Of the many raw materials required by aquatic plants (phytoplankton and macrophytes) for growth, carbon, nitrogen, and phosphorus are the most important. Carbon is available from carbon dioxide, which is in almost unlimited supply. Since growth is generally limited by the essential nutrient that is in lowest supply, either nitrogen or phosphorus is usually the limiting nutrient for growth of primary producers. If these nutrients are available in adequate supply, massive algal and macrophyte blooms may occur with severe consequences for the lake. Most commonly in lakes, phosphorus is the limiting nutrient for aquatic plant growth. In these situations, adequate control of phosphorus, particularly from anthropogenic sources, can control growth of aquatic vegetation. Phosphorus can in some cases, be removed from the water column by precipitation, as described in the *Technical Support Manual, Volume III* (USEPA, 1984b).

### ***Eutrophication and Nutrient Cycling***

The term "eutrophication" is used in two general ways: (1) eutrophication is defined as the process of nutrient enrichment in a water body; and (2) eutrophication is used to describe the effects of nutrient enrichment, that is, the uncontrolled growth of plants, particularly phytoplankton, in a lake or reservoir. The second use also encompasses changes in the composition of animal communities in the water body. Both uses are commonly found in the literature, and the distinction, if important, must be discerned from the context of use.

Eutrophication is often greatly accelerated by anthropogenic nutrient enrichment, which has been termed "cultural eutrophication." Nutrients are transported to lakes from external sources, and once in the lake, may be recycled internally. A consideration of attainable uses in a lake must include an understanding of the sources of nitrogen and phosphorus, the significance of internal cycling, especially of phosphorus, and the changes that might be anticipated if eutrophication could be controlled.

### ***Significance of Chemical Phenomena to Use Attainability***

The most critical water quality indicators for aquatic use attainment in a lake are DO, nutrients, chlorophyll-a, and toxicants. In evaluating use attainability, the relative importance of three forms of oxygen demand should be considered: respiratory demand of phytoplankton and macrophytes during non-photosynthetic periods, water column demand, and benthic demand. If use impairment is occurring, assessments of the significance of each oxygen sink can be useful in evaluating the feasibility of achieving sufficient pollution control, or in implementing the best internal nutrient management practices to attain a designated use.

Chlorophyll-a is a good indicator of algal concentrations and of nutrient overenrichment. Excessive phytoplankton concentrations, as indicated by high chlorophyll-a levels, can cause adverse DO impacts such as:

- wide diurnal variation in surface DO due to daytime photosynthesis and nighttime respiration, and



- depletion of bottom DO through the decomposition of dead algae.

As discussed previously, nitrogen and phosphorus are the nutrients of concern in most lake systems, particularly where anthropogenic sources result in increased nutrient loading. It is important to base control strategies on an understanding of the sources of each type of nutrient, both in the lake and in its feeder streams.

Also, the presence of toxics such as pesticides, herbicides, and heavy metals in sediments or the water column should be considered in evaluating uses. These pollutants may prevent the attainment of uses (particularly those related to fish propagation and maintenance in water bodies) that would otherwise be supported by the water quality criteria for DO and other parameters.

### ***Biological Characteristics***

A major concern for lake biology is the eutrophication due to anthropogenic sources of nutrients. The increased presence of nutrients may result in phytoplankton blooms that can, in turn, have adverse impacts on other components of the biological community. A general trend that results from eutrophication is an increase in numbers of organisms but a decrease in diversity of species, particularly among nonmotile species. The biological characteristics of lakes are discussed in more detail in the *Technical Support Manual, Volume III*.

### ***Techniques for Use Attainability Evaluations***

Techniques for use attainability evaluations of lakes are discussed in detail in the *Technical Support Manual, Volume III*. Several empirical (desktop) and simulation (computer-based mathematical) models that can be used to characterize and evaluate lakes for use attainability are presented in that document and will not be included here owing to the complexity of the subject.

# Water Quality Standards Handbook

## Chapter 3: Water Quality Criteria

*The WQS Handbook does not impose legally binding requirements on the EPA, states, tribes or the regulated community, nor does it confer legal rights or impose legal obligations upon any member of the public. The Clean Water Act (CWA) provisions and the EPA regulations described in this document contain legally binding requirements. This document does not constitute a regulation, nor does it change or substitute for any CWA provision or the EPA regulations.*

# Water Quality Standards Handbook

## Chapter 3: Water Quality Criteria

[\(40 CFR 131.11\)](#)

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## Introduction

The [Clean Water Act \(CWA\)](#) and [40 CFR Part 131](#) require states and authorized tribes<sup>1</sup> to adopt water quality standards (WQS) consisting of three key components: designated uses, [water quality criteria](#), and an antidegradation policy<sup>2</sup>. This chapter describes ambient water quality criteria (AWQC). Specifically, Sections 3.1 and 3.2 provide background information on criteria and the general forms criteria can take. Section 3.3 describes human health criteria and the EPA's recommendations for developing such criteria. Section 3.4 describes criteria to protect recreation. Section 3.5 describes aquatic life criteria and the EPA's recommendations for developing such criteria. Section 3.6 describes nutrient (e.g., nitrogen and phosphorus) criteria, and Sections 3.7 through 3.12 describe special considerations for biological criteria, hydrologic flow, sediment, temperature, wildlife, and wetlands. Section 3.13 provides a discussion of special considerations for priority pollutants. Section 3.14 describes criteria to protect agricultural and industrial designated uses.

### 3.1 Water Quality Criteria

Under Section 303(c)(2)(A) of the [CWA](#), states and authorized tribes are responsible for adopting water quality standards that "...consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." These standards shall "...protect the public health or welfare, enhance the quality of water and serve the purposes of this Act." 40CFR 131.3(b) further defines criteria as "...elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use." Water quality criteria represent the conditions (e.g., concentrations of particular chemicals, levels of certain parameters) sufficient to restore and maintain the chemical, physical, and biological integrity of water bodies and protect applicable designated uses. Generally, criteria provide for the protection and propagation of fish, shellfish, and wildlife as well as

#### Toxic and Priority Pollutants

Section 307(a)(1) of the Clean Water Act establishes a list of **toxic pollutants**, originally contained in a House of Representatives committee report and subsequently promulgated by the EPA at [40 CFR 401.15](#). When this chapter refers to toxic pollutants, it is referring specifically to the pollutants regulated under CWA section 307(a)(1). When the chapter refers to **pollutants with toxic effects** it is including all pollutants that may have toxic properties, not just those specifically regulated under CWA section 307(a)(1).

To prioritize action on the pollutants on the toxic pollutant list and to make the list more usable, the EPA created its list of **priority pollutants**, at [40 CFR Part 423, Appendix A](#). The priority pollutant list identifies, among other things, individual chemical names, as opposed to the toxic pollutant list which identified general classes of pollutants. In this chapter, the terms priority pollutants and toxic pollutants are used interchangeably.

For more information see section 3.13 of this chapter and <https://www.epa.gov/eg/toxic-and-priority-pollutants-under-clean-water-act>.

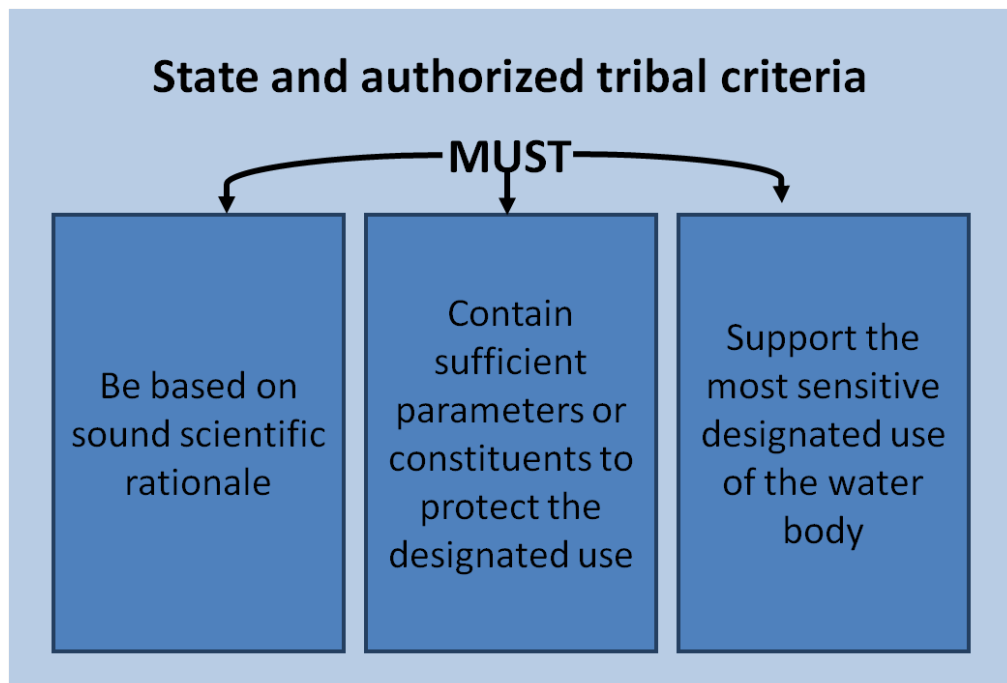
<sup>1</sup> Throughout this document and the [CWA](#), the term "states" means the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the United States Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. The term "authorized tribes" means those federally recognized Indian tribes with authority to administer a CWA WQS program.

<sup>2</sup> The CWA specifies that WQS must consist of designated uses and criteria to protect such uses. In 1987, Congress amended the CWA to recognize that antidegradation requirements are also part of water quality standards (see section 303(d)(4)(B)). EPA's regulation at 40 CFR 131.3(i) provides that WQS "are provisions of State or Federal law" that consist of designated uses and water quality criteria. 40 CFR §§131.5(a)(3), 131.6(d), and 131.12 further reinforce that antidegradation requirements are part of WQS.

recreation in and on the water. If a criterion is exceeded, the water quality may pose a human health or ecological risk, and protective or remedial action may be needed.

To provide scientific guidance to states and authorized tribes, the EPA publishes, and from time to time revises, criteria for water quality under Section 304(a) that accurately reflect the latest scientific knowledge. The EPA’s [Section 304\(a\) national criteria recommendations](#) (sometimes referred to as “304(a) criteria”) provide quantitative concentrations or levels and/or qualitative measures of pollutants that, if not exceeded, will generally ensure adequate water quality for protection of a designated use. The EPA’s supporting documentation for 304(a) criteria recommendations also includes evaluations of available scientific data on the effects of the pollutants such as effects on public health and welfare, aquatic life, and recreation. The EPA develops 304(a) criteria recommendations based on the best available science, scientific literature review, established procedures for risk assessment, EPA policies, external scientific peer review, and public input. Because the purpose of the EPA’s 304(a) criteria recommendations, as set out in the CWA, is solely to identify levels of pollutants in water that will ensure adequate water quality protection of designated uses, the recommendations are made independent of other considerations. The EPA’s 304(a) criteria recommendations do not impose legally binding requirements. Therefore, they do not substitute for the CWA or regulations, and they are not regulations themselves.

In accordance with [40 CFR 131.11](#), states and authorized tribes must adopt water quality criteria that “...protect the designated use.” The EPA recommends that states and authorized tribes consider the Agency’s national recommended water quality criteria when developing their criteria. However, states and authorized tribes may adopt, where appropriate, other scientifically defensible criteria that differ from the EPA’s recommendations (Section 3.2.1 of this chapter describes the options for states in deriving numeric water quality criteria). Per 40 CFR 131.11(a)(1), state and authorized tribal criteria must meet the requirements presented in Figure 3.1.



**Figure 3.1: Requirements of State and Authorized Tribal Criteria under 40 CFR 131.11(a)(1)**

While most 304(a) criteria recommendations represent specific levels of chemicals in the water that are not expected to pose significant human health or ecological risks, certain pollutants primarily exert their toxic effects by accumulating in fish tissue. For such cases, a fish tissue-based criterion may be appropriate. Water column-based criteria can be derived from fish tissue-based criteria using chemical-specific translation methods. As an example, the EPA's [Final Aquatic Life Ambient Water Quality Criteria for Selenium – Freshwater \(2016\)](#) includes both fish tissue-based components as well as a translation to water column-based components. It also includes methods that a state or authorized tribe can use to derive a site-specific water column translation of the fish tissue component. Another example of a chemical-specific translation method can be found in the EPA's [Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion \(2010\)](#).

Under Section 303(c) of the CWA, the EPA reviews and approves or disapproves state and authorized tribal WQS to ensure that the above requirements, among others, are met. The EPA recommends states and authorized tribes develop a record describing the scientific justification for their adopted criteria and the public participation process. If a state or authorized tribe relies on 304(a) criteria recommendations (or other up-to-date EPA guidance documents), they may reference and rely on the data in those documents and may not need to create duplicative or new material for inclusion in their records. However, where the state or authorized tribe adopts site-specific criteria or uses an approach that differs from that of the EPA's current recommendations, the approach must meet the requirements of 40 CFR 131.11(a) and should be clearly documented and transparent. In the case where a state has chosen not to adopt a new criterion or update a criterion for a parameter for which the EPA has provided new or updated CWA section 304(a) criteria recommendations, the EPA's provision at 40 CFR 131.20(a) requires states and authorized tribes to provide an explanation for why it is choosing not to adopt new or revised criterion at that time. This explanation must be provided to the EPA when the state submits the results of its triennial review, consistent with 40 CFR 131.20(c). This explanation, while not approved or disapproved by the EPA, is an important method for a state or authorized tribe to use to explain its rationale to the public and be transparent in its decision-making process. Please see [Chapter 7](#) of this Handbook for additional information on the requirements at 40 CFR 131.20.

The EPA recommends that states and authorized tribes coordinate with the EPA before beginning activities to adopt new or revised WQS long before they formally submit the WQS for EPA review. Reasons for early coordination with the EPA include the following:

- Early identification of potential areas of scientific or programmatic concern that require resolution between the EPA and the state or authorized tribe, or with the federal agencies responsible for any relevant threatened or endangered species.
- Discussion and resolution of any such concerns before the EPA receives a formal review request from the state or authorized tribe.
- Increased likelihood that state or authorized tribal WQS meet the requirements of the CWA and 40 CFR 131 at the time of submission to the EPA.

While not a regulatory requirement, states and authorized tribes may send draft WQS to the EPA for early feedback. The EPA will then provide comments on the proposed revisions to assist the state or authorized tribe in developing WQS that are approvable. Coordination between the state or authorized tribe and the EPA throughout the review process may assist in the EPA's timely review of state and authorized tribal WQS.

States and authorized tribes implement their criteria in the context of the water quality management activities they conduct under the CWA. For example, they utilize their criteria when deriving appropriate water quality-based effluent limits (WQBELs) for National Pollutant Discharge Elimination System (NPDES) permits. They also use their criteria when determining whether a water body is attaining its WQS.

In making water quality management decisions such as Section 303(d) listing decisions, the EPA recommends that states and authorized tribes apply each criterion independently to the particular water body. “Independent application” means that, where different types of assessment information are available (e.g., monitoring data for toxicity, water chemistry, and biology), any one assessment is sufficient to identify an existing or potential impairment regardless of the results from other types of assessment. For example, available information might not indicate an exceedance of a chemical-specific criterion to protect aquatic life, but the biological assessment at the site indicates the aquatic life use is not being met. In that case, for purposes of making a listing decision under Section 303(d), the state would list the water as impaired for the aquatic life use. For additional information on independent application, see the EPA’s [Transmittal of Final Policy on Biological Assessments and Criteria, Memorandum from Rick Brandes \(1991\)](#), Section III.G of the EPA’s [Water Quality Standards Regulation, Advance Notice of Proposed Rulemaking \(1998\)](#), and Section IV.K of the EPA’s [2006 Integrated Reporting Guidance](#).

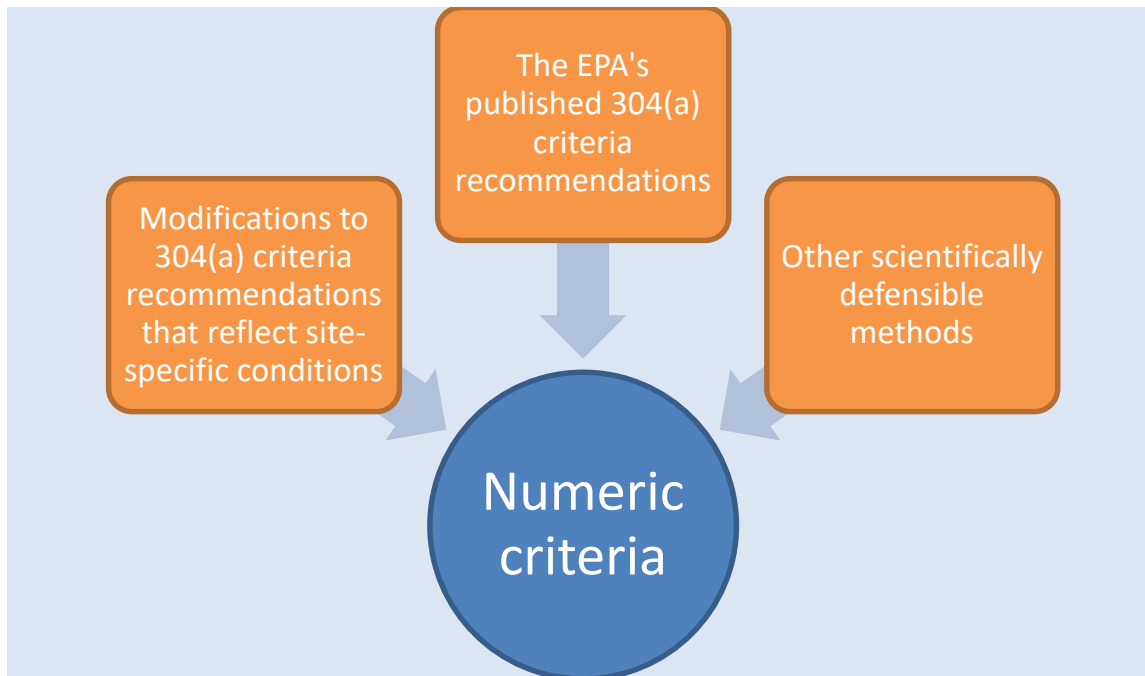
Additionally, when implementing WQS, if a water body has multiple designated uses with different criteria for the same pollutant, states and authorized tribes protect the most sensitive use, in accordance with 40 CFR 131.11(a).

The federal regulation at 40 CFR 131.10(b) requires that, when designating uses and associated criteria, states and authorized tribes consider “the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters.” For more information, see [Chapter 2](#) of this Handbook, as well as the EPA’s [Protection of Downstream Waters in Water Quality Standards: Frequently Asked Questions \(2014\)](#) and the EPA’s [Decision Tool for Downstream Water Quality Protection \(2014\)](#), which is an interactive interface designed to direct states and authorized tribes to resources and methodologies when developing criteria that provide for the attainment and maintenance of downstream WQS. The EPA has also developed [Templates for Narrative Downstream Protection Criteria in State Water Quality Standards](#) that states and authorized tribes can use to develop narrative criteria to address downstream protection.

## **3.2 Forms of Water Quality Criteria**

### **3.2.1 Numeric Water Quality Criteria**

In accordance with [40 CFR 131.11\(b\)\(1\)](#), in adopting water quality criteria, states and authorized tribes should adopt numeric criteria based on one of the methods provided in Figure 3.2. The majority of this chapter discusses the EPA’s recommended approaches for developing numeric criteria.



**Figure 3.2: Methods for States and Authorized Tribes to Derive Numeric Criteria According to 40 CFR 131.11(b)(1)**

### 3.2.2 Narrative Water Quality Criteria

In accordance with [40 CFR 131.11\(b\)\(2\)](#), in adopting water quality criteria, states and authorized tribes should “establish narrative criteria or criteria based on biomonitoring methods where numeric criteria cannot be established or to supplement numeric criteria.”

The following provides an example of a narrative criterion (adapted from the EPA’s [Model Water Quality Standards Template for Waters on Indian Reservations \(2016\)](#)):

*All waters shall be free from toxic, radioactive, conventional, non-conventional, deleterious or other polluting substances in amounts that will prevent attainment of the designated uses specified.*

*All waters shall be free from substances, attributable to wastewater discharges or other pollutant sources that do one or more of the following:*

1. *Settle to form objectionable deposits.*
2. *Float as debris, scum, oil, or other matter forming nuisances.*
3. *Produce objectionable color, odor, taste, or turbidity.*
4. *Cause injury to, are toxic to, or produce adverse physiological responses in humans, animals, or plants.*
5. *Produce undesirable or nuisance aquatic life.*



Narrative criteria for pollutants with toxic effects can be established in state and authorized tribal WQS in various forms. In addition to item four in the above example narrative criterion, a narrative toxic pollutant criterion can take the following (or similar) form:

*Waters shall be free from toxic pollutants in toxic amounts.*

Such narrative criteria can serve as the basis for establishing pollutant or chemical-specific WQBELs for wastewater or stormwater discharges where the state or authorized tribe has not adopted chemical-specific numeric criteria for a specific pollutant. They can also serve as a basis for establishing [whole-effluent toxicity \(WET\)](#) controls. See the EPA's NPDES permitting regulations at [40 CFR 122.44\(d\)](#).

Consistent with 40 CFR 131.11(a)(2), where a state or authorized tribe adopts narrative criteria for priority pollutants to protect designated uses, it must also provide information identifying the method by which it intends to regulate point source discharges of priority pollutants in water quality-limited waters based on such narrative criteria. Although not specifically required for non-priority pollutants, providing the same information for those other pollutants will help the EPA's review of criteria submitted by states. These implementation methods are often called "implementation procedures" or "translator procedures" or simply "translators." Such information may be included as part of the WQS or may be included in the documents generated by the state or authorized tribe in accordance with the Water Quality Planning and Management Regulations at [40 CFR 130](#). Procedures for the review and revision of WQS are discussed in depth in [Chapter 7](#) of this Handbook. The EPA recommends that states and authorized tribes include the following components in their implementation methods for translating narrative criteria for both priority pollutants and other pollutants with toxic effects:

- Specific, scientifically defensible technical methods for implementing the narrative criteria such as the following:
  - Methods for deriving chemical-specific values using available toxicity data, including methods for applying such values in developing WQBELs, and calculating site-specific values based on local water chemistry or biology.
  - Methods for developing and implementing WET criteria and controls.
  - Methods for developing and implementing biological criteria.
- Statements or procedures describing how the state or authorized tribe intends to integrate the methods into its pollutant control program (e.g., procedures for addressing conflicting or inconsistent results).
- Information necessary to apply the narrative criteria as numeric values, for example:
  - Methods the state or authorized tribe will use to identify pollutants it will regulate in a specific discharge.
  - A lifetime cancer risk level for carcinogens.
  - Methods for identifying compliance thresholds in permits where calculated WQBELs are below the levels of detection.
  - Methods for selecting appropriate hardness, pH, and temperature variables for criteria expressed as functions.
  - Methods or policies controlling the size and in-zone water quality of mixing zones.
  - Calculated critical low flow values for translating chemical-specific numeric criteria for aquatic life and human health into WQBELs.
  - Other methods and information needed to apply WQS on a case-by-case basis.

The EPA has developed administrative and scientific recommendations for states and authorized tribes to implement narrative criteria to comply with Section 303(c)(2)(B) of the [CWA](#). See the discussion in Section 3.13 of this chapter.

Wetlands are an example of a type of water body that states and authorized tribes may want to develop narrative criteria for, to provide a more relevant scientific basis for applying the provisions of the CWA to these unique waters. Wetlands criteria can be derived and supported using measurements of wetland function or condition. This typically involves intensive data collection dependent on a successful [wetland monitoring and assessment program](#). Due to the unique characteristics of wetlands relative to flowing surface waters, water quality standards for wetlands may differ from other water quality standards. For example, they may rely less on water chemistry parameters and more on diversity of vegetation or macroinvertebrate communities. Wetlands criteria may also differ from other criteria by relying on additional parts of state laws and regulations that do not apply to instream water quality. The EPA has developed [Templates for Developing Wetland Water Quality Standards](#) that states and authorized tribes may use as model language for including WQS specifically for wetlands.

### 3.3 Human Health Water Quality Criteria

[Human health water quality criteria](#) protect any designated uses related to ingestion of water, ingestion of aquatic organisms, or other waterborne exposure from surface waters. Such designated uses can include, but are not limited to, consumption of fish or shellfish (including consumption associated with fishing or shellfish harvesting), and protection of sources of drinking water. Note that recreational water criteria are covered in Section 3.4 of this chapter. Some states and authorized tribes include criteria intended to protect human health from consumption of fish or shellfish from recreational fishing activities under their recreational designated uses.

The EPA's current recommended approach for deriving 304(a) criteria recommendations for protection of human health is the [Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health \(2000\)](#) (hereafter referred to as the "2000 Human Health Methodology"). It also provides states and authorized tribes with scientifically sound options for developing their own human health criteria that consider local conditions. If states and authorized tribes choose to derive their own human health criteria or modify the EPA's 304(a) criteria recommendations, the EPA recommends that they use the 2000 Human Health Methodology and consider any updated and scientifically defensible data to guide their actions. In addition, the 2000 Human Health Methodology defines the default factors that the EPA uses in evaluating the soundness and consistency of state and authorized tribal WQS in accordance with Section 303(c) of the [CWA](#).

The derivation of human health criteria requires information about both the toxicological endpoints of concern for water pollutants and the pathways of human exposure to those pollutants. The two primary pathways of human exposure to pollutants present in a particular water body that the EPA considers in deriving human health 304(a) criteria recommendations are as follows:

- Direct and indirect ingestion of water obtained from the water body.
- Consumption of fish/shellfish obtained from the water body.

The EPA's [human health 304\(a\) criteria recommendations](#) are designed to minimize the risk of adverse effects occurring to humans from chronic (i.e., lifetime) exposure to pollutants through the ingestion of

drinking water and consumption of fish obtained from surface water. Information on deriving human health criteria is included in the subsections below. In contrast, the [Safe Drinking Water Act \(SDWA\)](#) controls the presence of contaminants in finished ("at-the-tap") drinking water.

In situations where states and authorized tribes do not develop their own criteria, and the EPA has not developed human health 304(a) criteria recommendations, states and authorized tribes have looked to maximum contaminant levels (MCL) and maximum contaminant level goals (MCLG) under the SDWA to protect public water supply designated uses. MCLGs, like human health 304(a) criteria recommendations, are health-based. MCLs, on the other hand, are developed with consideration given to the costs and technological feasibility of reducing contaminant levels in water to meet those standards. In addition, MCLs do not consider exposure pathways beyond drinking water, e.g., exposures via fish consumption. The EPA recommends that states and authorized tribes do not use MCLs as water quality standards where consideration of available treatment technology, costs, or availability of analytical methodologies has resulted in an MCL that is less protective than an MCLG. For more information, see Section II.H of the EPA's [Revisions to the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health \(2000\), Notice of Availability](#).

In 2015, the EPA revised 94 of the existing CWA section 304(a) recommended water quality criteria for human health to reflect the latest scientific information, including updated exposure factors (body weight, drinking water consumption rates, fish consumption rate), bioaccumulation factors, and toxicity factors (reference dose, cancer slope factor). The criteria have also been updated to follow the 2000 Human Health Methodology. The EPA's [National Recommended Human Health Water Quality Criteria](#) website provides more information on the final updated criteria and supporting documents.

For detailed information about how to derive human health criteria, including the equations, please see the EPA's [2000 Human Health Methodology](#).

### **3.3.1 Toxicological Endpoints – Reference Dose and Cancer Slope Factor**

For non-cancer toxicological effects, the EPA typically uses a reference dose (RfD) to derive human health criteria. In general, an RfD is the amount of a chemical that a person can ingest every day for a lifetime that is not anticipated to cause harmful noncancer health effects. For cancer toxicological effects, the EPA typically uses an oral cancer slope factor (CSF) to derive human health criteria.

The EPA considers toxicity factors from EPA program offices, other national and international programs, and state and authorized tribal programs. The EPA recommends that states and authorized tribes use the most up-to-date, scientifically sound toxicity data when deriving human health criteria. The EPA follows a systematic process, detailed in the [EPA Response to Scientific Views from the Public on Draft Updated National Recommended Water Quality Criteria for the Protection of Human Health \(2015\)](#), to search for and select the toxicity values used to derive the human health criteria for noncarcinogenic and carcinogenic effects.

### **3.3.2 Human Exposure Considerations Used in Water Quality Criteria Derivation**

The discussion below describes the parameters chosen by the EPA for use in the human health criteria derivation equations in order to protect the general population over a lifetime. States and authorized tribes may modify the EPA's recommendations, as appropriate, to protect specific sensitive populations. For example, if pregnant women or young children are the target populations, then the EPA

recommends criteria development using specific exposures for those groups. For more information on exposure considerations for children and sensitive target populations, see the [2000 Human Health Methodology](#). Updated exposure parameters for sensitive populations may also be found in the EPA's [Exposure Factors Handbook 2011 Edition \(Final\)](#) (hereafter referred to as the "2011 Exposure Factors Handbook") and the EPA's updated fish consumption report [Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations \(NHANES 2003-2010\) \(2014\)](#).

### *Body Weight*

The EPA's 2015 updated recommended exposure assumption for body weight is 80 kg, which represents the mean weight for adults 21 years of age and older based on data derived from the Center for Disease Control and Prevention's [National Health and Nutrition Examination Survey \(NHANES\)](#) 1999–2006 data. This recommendation is found in Table 8.1 in the [2011 Exposure Factors Handbook](#). This updated body weight assumption replaced the EPA's previously recommended weight for adults of 70 kg that was described in the [2000 Human Health Methodology](#), which was approximated from the mean body weight of adults from the NHANES III database (1988-1994) and a 1989 study by the National Cancer Institute (see the 2000 Human Health Methodology for additional information). Chapter 8 of the 2011 Exposure Factors Handbook also contains recommendations for body weights of pregnant women, children, and infants.

### *Drinking Water Intake*

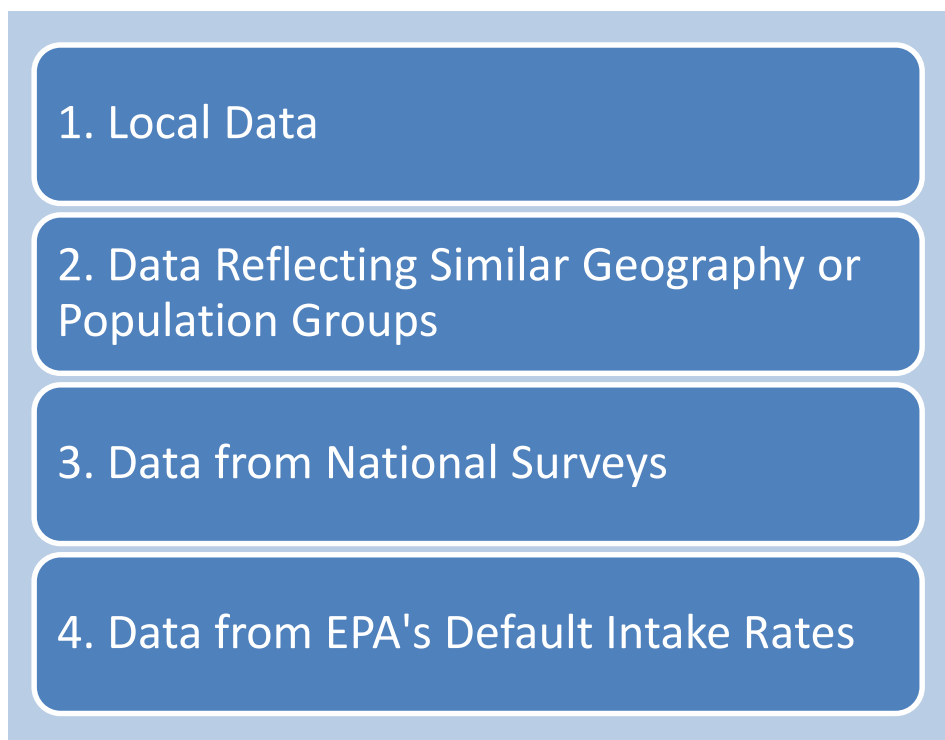
Based on [NHANES](#) 2003-2006 data, the EPA's 2015 updated recommended exposure assumption for drinking water intake is 2.4 liters/day (L/d), rounded from 2.414 L/d for per capita estimate of combined direct and indirect "community water" ingestion at the 90<sup>th</sup> percentile for adults 21 years of age and older. For this estimate, direct water is defined as water ingested directly as a beverage (from community water sources); indirect water is defined as water added in the preparation of food or beverages but not water intrinsic to purchased foods. Community water includes direct and indirect use of tap water and excludes bottled water and other sources such as water from wells and springs. This recommended value is found in Chapter 3 (Table 3-23) of the [2011 Exposure Factors Handbook](#). This updated drinking water rate replaces the drinking water intake assumption of 2 L/d described in the [2000 Human Health Methodology](#), which represented the 86<sup>th</sup> percentile for adults 20 years and older in the United States Department of Agriculture's (USDA) Continuing Survey of Food Intake by Individuals 1994-96 analysis, or the 88<sup>th</sup> percentile of adults in the National Cancer Institute study of the 1977-78 Nationwide Food Consumption Survey (see the 2000 Human Health Methodology for additional information). Chapter 3 of the 2011 Exposure Factors Handbook also contains drinking water intake recommendations for women of childbearing age and children.

### *Fish Consumption Rate*

In 2014, the EPA updated its recommended default fish consumption rate (FCR) for the general adult population and sport fishers, and incorporated this updated rate into its 2015 updated 304(a) recommended human health criteria. This updated default FCR for the general adult population and sport fishers is 22 grams/day (g/d) (0.022 kg/d). The updated FCR of 22 g/d represents the 90<sup>th</sup> percentile consumption rate of freshwater and estuarine fish for the United States adult population that is 21 years of age and older based on [NHANES](#) 2003-2010 data (see the EPA's [Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations \(NHANES 2003-2010\) \(2014\)](#)). This updated FCR replaces the previously recommended default of 17.5 g/d, which represented an

estimate of the 90th percentile consumption rate of freshwater and estuarine fish for the adult population based on the USDA's Continuing Survey of Food Intake by Individuals 1994-96 data (see the EPA's [Estimated Per Capita Fish Consumption in the United States \(2002\)](#)).

As identified in the [2000 Human Health Methodology](#), the level of fish intake varies by geographic location. Therefore, the EPA recommends a hierarchy for states and authorized tribes to follow that encourages use of the best data available to derive fish consumption rates (illustrated in figure 3.3). The EPA recommends that states and authorized tribes consider developing water quality criteria to protect highly exposed population sub-groups and use local or regional data, as they should be more representative of target population group(s) than the EPA's default values. The EPA's recommended four-preference hierarchy is displayed in Figure 3.3.



**Figure 3.3: The EPA's Recommended Four-preference Hierarchy for Collecting the Data Used to Derive Fish Consumption Rates**

Consumption of locally harvested fish and shellfish by American Indian tribes or other groups engaged in subsistence fishing is likely to be higher than it is for the general United States population. For subsistence fishers, the EPA's default FCR is 142 g/d. The EPA recommends that states and authorized tribes consider site-specific and tribal-specific factors when determining FCRs for highly exposed populations. Local data may include data from a variety of contexts, including consumption by the general population state-wide, by a specific subpopulation within the state or region, consumption of fish taken from a specific water body or within a specific community, or a traditional baseline heritage rate. Depending on the data used, it may be appropriate to adjust the contemporary rate to account for suppression effects. A suppression effect occurs when a fish consumption rate for a given subpopulation reflects a current level of consumption that is artificially diminished from an appropriate baseline level

of consumption for that subpopulation. The more robust baseline level of consumption is “suppressed,” as it does not get captured by the fish consumption rate. Suppression effects may arise as a result of contaminated aquatic ecosystems, depleted aquatic ecosystems and fisheries, or both. When agencies set environmental standards using a fish consumption rate based upon an artificially diminished consumption level, they may set in motion a downward spiral whereby the resulting standards permit further contamination and/or depletion of the fish and aquatic resources.

It is important for states and authorized tribes to account for the suppression effect by documenting a heritage or unsuppressed rate with additional literature-based research (for tribes, for instance), or by evaluating recent past rates through a survey, and subsequently adjusting the contemporary rate. Because the CWA is meant not merely to maintain the status quo, but to *restore* and maintain the chemical, physical, and biological integrity of the Nation’s waters, deriving criteria using an unsuppressed FCR furthers the restoration goals of the CWA and ensures protection of human health-related designated uses (i.e., as pollutant levels decrease, fish habitats are restored, and fish availability increases over time). The EPA’s [Guidance for Conducting Fish Consumption Surveys \(2016\)](#) provides advice on how to conduct surveys to estimate fish consumption. Also, when looking at heritage or past consumption rates, states and authorized tribes may want to consider today’s caloric needs of the target population or the degree to which a traditional subsistence lifestyle is the protection goal. See the [EPA’s action letter and associated technical support document](#) for approving the Spokane Tribe’s 2010 WQS revisions for more information on such an approach.

The [EPA Policy on Consultation and Coordination with Indian Tribes \(2011\)](#) and the accompanying [EPA Guidance for Discussing Tribal Treaty Rights \(2016\)](#) describe how the EPA is to consult and coordinate on a government-to-government basis with federally recognized tribal governments when the EPA’s actions and decisions may affect tribal interests in areas where tribal treaties exist. Specifically, the 2016 Guidance provides assistance on consultation and coordination with respect to the EPA’s decisions that are focused on specific geographic areas when tribal treaty rights, or other reserved rights relating to the protection or use of natural resources, or an environmental condition necessary to support natural resources, may exist.

The EPA recommends that states or authorized tribes establishing water quality standards (or planning fish consumption surveys that may inform environmental regulatory actions) for geographic areas that include tribal lands, rights, or populations consider the potential relevance of tribes’ treaty and/or other reserved rights to such WQS actions to ensure that the actions are protective of tribal fishers exercising those rights, as applicable.

For additional information, see the EPA’s [Human Health Ambient Water Quality Criteria and Fish Consumption Rates: Frequently Asked Questions \(2013\)](#) and the National Environmental Justice Advisory Council’s report, [Fish Consumption and Environmental Justice \(2002\)](#).

### *Bioaccumulation*

Bioaccumulation refers to the uptake and retention of a chemical by an aquatic organism from all surrounding media (e.g., water, food, sediment) whereas bioconcentration refers to the uptake and retention of a chemical by an aquatic organism from water only. For some chemicals, particularly those that are persistent and hydrophobic, the magnitude of bioaccumulation by aquatic organisms can be substantially greater than the magnitude of bioconcentration. Thus, an assessment of bioconcentration alone may underestimate the extent of accumulation in aquatic biota for these chemicals.

The magnitude of bioaccumulation by aquatic organisms varies widely depending on the chemical, but can be extremely high for some persistent and hydrophobic chemicals. For such bioaccumulative chemicals, concentrations in aquatic organisms may pose unacceptable human health risks from fish and shellfish consumption even when concentrations in water are too low to cause unacceptable health risks from drinking water consumption alone. These chemicals may also biomagnify in aquatic food webs, a process whereby chemical concentrations increase in aquatic organisms of each successive trophic level due to increasing dietary exposures (e.g., increasing concentrations from algae, to zooplankton, to forage fish, to predatory fish).

The EPA's [2000 Human Health Methodology](#) recommends the use of bioaccumulation factors (BAFs), where available, to reflect the uptake of a contaminant from all sources (e.g., ingestion, sediment) by fish and shellfish, rather than only from the water column as reflected by the use of bioconcentration factors (BCFs) in the 1980 Human Health Methodology.<sup>3</sup> Criteria developed using BAFs better represent exposures to pollutants that affect human health than do criteria developed using BCFs. The EPA's [Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health \(2000\); Technical Support Document Volume 2: Development of National Bioaccumulation Factors \(2003\)](#) contains procedures for calculating BAFs. The EPA also recommends that states and authorized tribes calculate site-specific BAFs, where possible, for use in developing their state and authorized tribal human health water quality criteria. The EPA's [Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health \(2000\); Technical Support Document Volume 3: Development of Site-Specific Bioaccumulation Factors \(2009\)](#) contains procedures for calculating site-specific BAFs. The EPA applied the methodologies above in its 2015 human health criteria updates. More information on the development of national BAFs for the 2015 update is available in the [Development of National Bioaccumulation Factors: Supplemental Information for EPA's 2015 Human Health Criteria Update \(2016\)](#). A [spreadsheet of national BAFs](#) developed for the 2015 update is also available.

### *Relative Source Contribution*

For non-carcinogens and non-linear carcinogens, the EPA includes a relative source contribution (RSC) component in human health water quality criteria calculations. The RSC represents the appropriate portion of the RfD to be attributed to ambient water and freshwater and estuarine fish consumption. This is usually expressed as a percentage of the RfD but can also be expressed as an absolute value after subtracting an allowance to reflect exposures that may come from sources not considered in the criterion derivation. The rationale for this approach is that, for pollutants exhibiting threshold effects (i.e., pollutants which exhibit toxicity above a certain level of that pollutant), the objective of the human health criterion is to ensure that an individual's total exposure from all sources does not exceed a threshold level. These sources include, but are not limited to, exposure to a particular pollutant from ocean fish consumption (not included in the fish consumption rate), non-fish food consumption (fruits, vegetables, grains, meats, poultry), dermal exposure, and respiratory exposure.

The EPA recommends following the Exposure Decision Tree in Figure 4-1 of the [2000 Human Health Methodology](#) to determine the appropriate RSC. A default RSC of 20 percent is recommended and used by the EPA in deriving Section 304(a) recommended criteria for non-carcinogens and non-linear

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<sup>3</sup> United States Environmental Protection Agency. 1980. Appendix C—Guidelines and methodology used in the preparation of health effect assessment chapters of the consent decree water criteria documents. *Federal Register* 45:79347-79357.

carcinogens where data are insufficient to characterize the likelihood of exposure to relevant sources. The 20 percent default RSC should only be replaced where sufficient data are available to develop a scientifically defensible alternative value. For example, in the [2015 updated criteria recommendations for the protection of human health](#), the EPA defined a RSC of 0.5 or 0.8 for several pollutants based on currently available data regarding human exposure to these pollutants.

### *Cancer Risk Levels*

For deriving human health 304(a) criteria recommendations based on the [2000 Human Health Methodology](#), the EPA uses the  $10^{-6}$  (i.e., 1 chance in 1,000,000) risk level. However, when states and authorized tribes develop their criteria,  $10^{-5}$  (i.e., 1 chance in 100,000) may be acceptable for the general target population depending on the particular circumstances. It is important to note that the incremental cancer risk levels are *relative*, meaning that any given criterion associated with a particular cancer risk level is also associated with specific exposure parameter assumptions (i.e., fish consumption rate, drinking water intake, body weight). Selection of a cancer risk level to derive human health criteria should involve careful consideration of the associated exposure parameter assumptions, and whether the resulting criteria would expose the target population consuming fish at unsuppressed rates to no more than a  $10^{-5}$  cancer risk (or sensitive subpopulations consuming fish at unsuppressed rates to no more than a  $10^{-4}$  cancer risk). See the Fish Consumption Rate section above for more information on the suppression effect.

Additional information is available in the EPA's [Human Health Ambient Water Quality Criteria and Fish Consumption Rates: Frequently Asked Questions \(2013\)](#) and the National Environmental Justice Advisory Council's report, [Fish Consumption and Environmental Justice \(2002\)](#).

## **3.4 Recreational Water Quality Criteria**

In 2012, the EPA issued updated [ambient water quality criteria recommendations for recreational waters](#) for two bacterial indicators of fecal contamination: *Escherichia coli* and enterococci. The new criteria are designed to protect primary contact recreational uses including swimming, bathing, surfing, water skiing, tubing, water play by children, and similar water contact activities where a high degree of bodily contact with the water, immersion and ingestion are likely. These recommendations rely on the latest research and science including studies that show a link between gastrointestinal and respiratory illnesses and fecal contamination in recreational waters. Although the 2012 criteria apply to both coastal and non-coastal primary contact recreation waters, the 2012 criteria were developed to meet statutory obligations under the [Beaches Environmental Assessment and Coastal Health \(BEACH\) Act of 2000](#), which amended the CWA. The BEACH Act includes specific requirements related to coastal recreational waters and water quality criteria for those waters. In addition, in 2016, the EPA issued draft [Human Health Recreational Ambient Water Quality Criteria and/or Swimming Advisories for Microcystins and Cylindrospermopsin](#). These are draft recommended concentrations of the cyanotoxins in recreational waters to protect primary contact recreational uses.

As a general guideline, the EPA recommends that states and authorized tribes avoid situations in which recreational waters contain chemicals in concentrations that are toxic or otherwise harmful to humans if ingested or irritating to the skin or mucous membranes of the human body upon brief immersion. Protection from these types of effects is the subject of the human health criteria discussed in Section 3.3 of this chapter. For example, the EPA's human health 304(a) criteria recommendations for pollutants



with toxic effects, which are designed to protect direct human drinking water intake and fish consumption, might provide useful guidance in these circumstances. Additionally, such criteria may be used to support the designated use where fishing is included in the state or tribal definition of "recreation." In this latter situation, where consumption of aquatic life is possible, the state or authorized tribe should use only the portion of the criterion based on fish consumption unless drinking water supply is also a designated use. The EPA notes that criteria to protect human health when aquatic organisms are consumed may also be applied in association with aquatic life designated uses. See the EPA's [Use of Fish and Shellfish Advisories and Classifications in 303\(d\) and 306\(b\) Listing Decisions, WQSP-00-03, \(2000\)](#).

If a water body is not designated as a drinking water supply source, a state can adopt human health criteria for consumption of organisms only; instead of for consumption of water and organisms. The EPA recommends, however, that the state evaluate whether organism-only AWQC for non-bioaccumulative chemicals pose a risk to swimmers in those water bodies. For an example, see the EPA's [Update of Human Health Ambient Water Criteria: Cyanide \(2015\)](#).

States and authorized tribes may also include other provisions in their WQS to protect the physical parameters necessary for the protection of recreational uses such as a narrative criterion stating that stream flows shall support recreational uses.

The EPA has developed and published online a technical support document and an overview document that provide information for states and authorized tribes on flexible approaches for developing site-specific recreational criteria that reflect the latest science:

- [Overview of Technical Support Materials: A Guide to the Site-Specific Alternative Recreational Criteria TSM Documents \(2014\)](#) is an overarching guide designed to help water quality managers evaluate their site information and choose the best technical approach for developing site-specific recreational criteria.
- [Site-Specific Alternative Recreational Criteria Technical Support Materials for Alternative Indicators and Methods \(2014\)](#) describes how to evaluate and compare alternative methods for measuring microbes in water using an existing EPA-approved method.
- [Microbial Risk Assessment \(MRA\) Tools, Methods, and Approaches for Water Media \(2014\)](#) assists risk assessors and scientists in developing rigorous and scientifically defensible risk assessments for waterborne pathogens.

### 3.5 Aquatic Life Water Quality Criteria

[Aquatic life water quality criteria](#) are necessary to support any designated uses related to protection and propagation of fish, shellfish, and wildlife.

The EPA uses [Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses \(1985\)](#) (commonly referred to as the "1985 Guidelines" or "Aquatic Life Guidelines" and hereafter referred to in this document as "Aquatic Life Guidelines") to derive 304(a) criteria recommendations to protect aquatic life from the effects of toxic pollutants. These guidelines describe an objective way to estimate the highest concentration of a substance in water that will not present a significant risk to the aquatic organisms in the water. This EPA method relies primarily on acute and chronic laboratory toxicity data for aquatic organisms from eight taxonomic groups reflecting

the distribution of aquatic organisms' taxa that are intended to be protected by water quality criteria. Acute criteria are derived using short-term (48- to 96-hour) toxicity tests on aquatic plants and animals. Chronic criteria can be derived using longer-term (7-day to greater than 28-day) toxicity tests, if available, or by using an acute-to-chronic ratio procedure if there are insufficient chronic data. If justified, acute and chronic aquatic life criteria may be related to other water quality characteristics such as pH, temperature, or hardness. Separate criteria are typically developed for freshwater and saltwater organisms. Other information from mesocosms (controlled field experiments) and field data are considered when available and as appropriate. The Aquatic Life Guidelines recommend that criteria are lowered to protect commercially or recreationally important species, where appropriate.

As mentioned above, the EPA's [aquatic life 304\(a\) criteria recommendations](#) represent specific levels of chemicals or conditions in a water body that are not expected to cause adverse effects to aquatic life. For metals, such recommendations are typically in the form of dissolved concentrations, with some exceptions (see the EPA's [Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria, Memorandum from Martha Prothro \(1993\)](#)).

### **3.5.1 Water Quality Criteria Expression**

Aquatic life water quality criteria are typically expressed in two forms, with different recommended magnitude and duration: 1) as acute criteria to protect against mortality or effects that occur due to a short-term exposure to a chemical and 2) as chronic criteria to protect against mortality, growth and reproductive effects that may occur due to a longer-term exposure to a chemical. Where appropriate, the calculated criteria may be made more stringent to protect commercially or recreationally important species, and criteria may also be made more stringent to protect endangered or threatened species.

Both the acute and chronic criteria have three components: criterion magnitude (i.e., the criterion maximum concentration (CMC) for acute criteria and criterion continuous concentration (CCC) for chronic criteria), duration of the CMC and CCC (i.e., averaging period), and a maximum allowable frequency of exceedance of the CMC and CCC. For aquatic life criteria based on standard laboratory toxicity tests, the EPA typically recommends average durations of one hour for the CMC and four days for the CCC. There are some exceptions to reflect unique characteristics of individual pollutants. For example, the EPA's 304(a) criteria recommendations for [ammonia](#) and [selenium](#) are expressed with 30-day averaging periods. The EPA typically recommends a maximum frequency of exceedance of not more than once in three years, on average, to allow for ecosystem recovery. For additional discussion of duration and frequency, see Appendix D of the EPA's [Technical Support Document for Water Quality-based Toxics Control \(1991\)](#).

### **3.5.2 Site-specific Aquatic Life Water Quality Criteria**

The EPA's regulation at [40 CFR 131.11\(b\)\(1\)\(ii\)](#) provides that states and authorized tribes may adopt water quality criteria that are "modified to reflect site-specific conditions." Site-specific criteria, as with all criteria, must be based on a sound scientific rationale and protect designated uses and are subject to EPA review and approval or disapproval under Section 303(c) of the [CWA](#). A site-specific criterion is developed to protect aquatic life at a particular site, usually by taking into account a site's physical, chemical, and/or biological conditions (i.e., water quality characteristics or species composition).

The EPA's aquatic life 304(a) criteria recommendations could be under- or over-protective if one or both of the following occur:

- Physical and/or chemical characteristics of the site alter the biological availability and/or toxicity of the chemical (e.g., alkalinity, hardness, pH, suspended solids, and salinity influence the concentration(s) of the toxic form(s) of some heavy metals, ammonia, and other chemicals).
- The species at the site are more or less sensitive than those included in the national criteria dataset (e.g., the national criteria dataset contains data for trout, salmon, penaeid shrimp, and other aquatic species that have been shown to be especially sensitive to some materials, and those species are not found at a site or downstream).

To appropriately protect the aquatic community under such circumstances, a state or authorized tribe may want to develop site-specific criteria. The EPA has developed the following procedures to derive site-specific aquatic life criteria:

- The Recalculation Procedure takes into account relevant differences between the sensitivities of the aquatic organisms in the national dataset and the sensitivities of organisms that occur at the site. For more information, refer to the EPA's [Revised Deletion Process for the Site-specific Recalculation Procedure for Aquatic Life Criteria \(2013\)](#), which updates and supersedes the deletion process step of the Recalculation Procedure contained within Appendix B of the EPA's *Interim Guidance on Determination and Use of Water-Effect Ratios for Metals* (1994) and the EPA's [Modifications to Guidance Site-Specific Criteria \(1997\)](#).
  - It should be noted that tested species present in the national criteria database are intended to serve as surrogates for other sensitive taxa that may occur at a site. Thus, care should be taken when considering removing any species from the national criteria database, such that continued protection of sensitive, untested species at the site is still ensured. Because some tested species might be needed to represent untested species that occur at the site, the deletion procedure does not provide for simplistic deletion of all species that do not occur at the site. Rather the concept is to consider which tested species are most closely related to those occurring at the site, and delete those for which another tested species would better represent the species occurring at the site.
- For [copper](#), the biotic ligand model (BLM) approach takes into account the effects of all of the water chemistry parameters that have a major influence on copper toxicity including temperature, pH, dissolved organic carbon, alkalinity, and the presence of specific cations and anions in the water. This approach allows the BLM-based criteria to be customized to the particular water body under consideration using the methodology described in the EPA's [Aquatic Life Ambient Freshwater Quality Criteria – Copper \(2007\)](#). Given the broad geographical range over which the BLM is likely to be applied, and the limited availability of data for input parameters in many areas, the EPA developed default values that can be used to fill in missing water quality input parameters. For more information, refer to [Draft Technical Support Document: Recommended Estimates for Missing Water Quality Parameters for Application in EPA's Biotic Ligand Model \(2016\)](#).
- For metals other than copper, the Water-Effect Ratio (WER) procedure takes into account relevant differences between the toxicities of a metal in laboratory dilution water and in the site water. In performing a WER, care must be taken to ensure that samples and tests are representative of the potential conditions at a site, such that the WER-derived criteria continue to be protective under conditions when the metals are highly bioavailable. For more information, refer to the EPA's [Interim Guidance on Determination and Use of Water-Effect Ratios for Metals \(1994\)](#) and [Modifications to Guidance Site-Specific Criteria \(1997\)](#).

Freshwater aquatic life criteria for certain metals are expressed as a function of hardness because hardness can affect the toxicities of these metals. Increasing hardness has the effect of decreasing the toxicity of metals. As described in [National Recommended Water Quality Criteria: 2002](#), the EPA recommends that hardness not have a low end cap (or floor) at 25 milligrams/liter (mg/L) or any other hardness value on the low end for metal criteria calculations. If a state or authorized tribe has a regulatory requirement to cap (at the low end) hardness at 25 mg/L or a situation-specific question about the applicability of the hardness-toxicity relationship, a WER procedure should be used to provide the level of protection intended by the EPA's [Aquatic Life Guidelines](#). For hardness over 400 mg/L, the EPA recommends two options: (1) calculate the criterion using a default WER of 1.0 and using a hardness of 400 mg/L in the hardness equation; or (2) calculate the criterion using a WER and the actual ambient hardness of the surface water in the equation.

Several states and authorized tribes include provisions in their WQS that allow adjustment of aquatic life numeric criteria to reflect the natural condition of the water body. In [Establishing Site Specific Aquatic Life Criteria Equal to Natural Background, Memorandum from Tudor T. Davies \(1997\)](#), the EPA described how states and authorized tribes could develop site-specific criteria to protect aquatic life designated uses based on natural background conditions. The memorandum recommends the following three basic elements that a state or authorized tribe should include in their WQS, at a minimum:

1. A definition of natural background describing the condition of water quality that would exist in the absence of human-caused pollution or disturbance.
2. A provision allowing for criteria to be set equal to natural conditions.
3. A written procedure for determining natural background or a reference in WQS to a binding procedure that the state or authorized tribe will use.

In recognition of the inherent challenges involved in identifying natural conditions, the EPA developed the [Framework for Defining and Documenting Natural Conditions for Development of Site-Specific Natural Background Aquatic Life Criteria for Temperature, Dissolved Oxygen, and pH: Interim Document \(2015\)](#) to provide clarity and direction for states and authorized tribes that want to establish site-specific criteria for temperature, dissolved oxygen, and pH that take into account natural background conditions. This Framework assists states and authorized tribes by providing an approach for successfully characterizing and identifying natural conditions for these three parameters, which then informs the development of site-specific criteria to protect aquatic life. It is important to note that this document only pertains to dissolved oxygen, pH, and temperature, not criteria for toxic pollutants. [Chapter 2](#) of this Handbook discusses how natural conditions may be addressed by refining designated uses.

The EPA encourages states or authorized tribes that are interested in developing site-specific criteria to involve the appropriate EPA regional office early in the process to identify and resolve any potential concerns prior to the EPA receiving a formal submittal of adopted WQS revisions for review. States, authorized tribes, and the EPA should judiciously consider all approaches, the complexity of the problem, and the extent of knowledge available concerning the fate and effects of the pollutant under consideration, to ensure that aquatic life are protected and the designated use(s) can be met.

States and authorized tribes are encouraged to examine their administrative and rulemaking procedures to identify opportunities to streamline adoption of site-specific criteria. One way to do this is through adoption of a "performance-based" approach. This approach relies on adoption of a process (i.e., a

criterion derivation methodology) rather than a specific outcome (e.g., numeric criterion or concentration of a pollutant) consistent with 40 CFR 131.11 and 131.13. The performance-based approach is particularly well suited for translating narrative criteria into quantifiable measures and for the derivation of site-specific numeric criteria. Proper development and implementation of such an approach can result in consistent application of state and authorized tribal narrative criteria and scientifically defensible site-specific adjustments to numeric criteria. When such a "performance-based" approach is sufficiently detailed and has suitable safeguards to ensure predictable, repeatable outcomes, EPA approval of such an approach can also serve as approval of the outcomes as well. If a particular state or authorized tribe's approach is not sufficiently detailed or lacks appropriate safeguards, then EPA review of a specific outcome is still necessary. However, even a more general performance-based approach would still help guide EPA review of specific outcomes. See [65 FR 24648](#).

Once the state or authorized tribe adopts and the EPA approves a set of procedures that qualify under the performance-based approach, subsequent site-specific criteria developed pursuant to that approved procedure do not need to be submitted to or approved by the EPA. This does not affect state-specific administrative processes that may require approval by different levels within the state. The EPA encourages the state or authorized tribe to maintain a list of the resulting site-specific criteria on their publicly accessible website. The EPA also encourages states and authorized tribes to coordinate closely with the EPA when developing any such approach. More information on the performance-based approach can be found in the EPA's [Review and Approval of State and Tribal Water Quality Standards, Final Rule \(2000\)](#). For example, the EPA [approved Oregon's statewide copper criteria](#), described as a performance-based provision, whereby copper criteria would be calculated at each site based on the site's water chemistry.

### 3.6 Nutrient Water Quality Criteria

Nutrient pollution is a widespread and growing environmental problem in the United States. Nutrient pollution can cause numerous adverse effects to aquatic life, impair recreational designated uses, and threaten human health by polluting drinking water supplies. For example, nutrient pollution is known to increase algal biomass (and specifically cause algal blooms), which can, in turn, deplete oxygen to levels that are harmful to other aquatic organisms, decrease the aesthetic and recreational value of a water body, and produce toxins that can harm humans and animals if inhaled or consumed, including during recreation in the water.

The EPA encourages states and authorized tribes to develop numeric nutrient water quality criteria to create effective tools to help prevent and manage nutrient pollution. Specifically, the EPA recommends that states and authorized tribes adopt numeric criteria into WQS for both total nitrogen and total phosphorus to help prevent eutrophication and the proliferation of harmful algal blooms in rivers and streams, lakes and reservoirs, and estuaries and coastal areas. In addition to the EPA's [Numeric Nutrient Water Quality Criteria website](#), see the following documents for more information:

- [Renewed Call to Action to Reduce Nutrient Pollution and Support for Incremental Actions to Protect Water Quality and Public Health, Memorandum from Joel Beauvais \(2016\)](#).
- [Preventing Eutrophication: Scientific Support for Dual Nutrient Criteria \(2015\)](#).
- [Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions, Memorandum from Nancy K. Stoner \(2011\)](#).

- [\*Nutrient Pollution and Numeric Water Quality Standards, Memorandum from Benjamin H. Grumbles \(2007\).\*](#)
- [\*Development and Adoption of Nutrient Criteria into Water Quality Standards, Memorandum from Geoffrey Grubbs \(2001\).\*](#)
- [\*National Strategy for the Development of Regional Nutrient Criteria \(1998\).\*](#)

To develop numeric nutrient criteria, the EPA recommends a variety of approaches such as the reference condition approach, empirical stressor-response models, and mechanistic water quality models. The EPA has published technical guidance describing the techniques for developing numeric nutrient criteria for different water body types, including nationally recommended [CWA Section 304\(a\) numeric nutrient criteria on an ecoregional basis](#) for most rivers/streams and lakes/reservoirs across the country. Additionally, the EPA's [Nutrient Scientific Technical Exchange Partnership and Support program \(N-STEPS\)](#) provides technical support to states and authorized tribes for the development of scientifically sound numeric nutrient criteria. N-STEPS provides the EPA, states, and authorized tribes a mechanism to work in partnership in addressing scientific issues related to numeric nutrient criteria derivation. See the EPA's [Technical Support for Numeric Nutrient Criteria Development webpage](#).

The following technical support documents describe the techniques that the EPA recommends to develop numeric nutrient criteria for use in state and authorized tribal WQS:

- [\*Using Stressor-response Relationships to Derive Numeric Nutrient Criteria \(2010\)\*](#)  
Describes a four-step approach to state, local, authorized tribal, and regional scientists for estimating and interpreting nutrient stressor-response relationships to derive numeric nutrient criteria.
- [\*Nutrient Criteria Technical Guidance Manual: Estuarine and Coastal Waters \(2001\)\*](#)  
Provides scientifically defensible technical guidance to assist states and authorized tribes in developing numeric nutrient criteria for estuaries and coastal waters.
- [\*Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs \(2000\)\*](#)  
Provides states and authorized tribes with a scientifically defensible method to develop ecoregion-specific nutrient criteria for lakes and reservoirs.
- [\*Nutrient Criteria Technical Guidance Manual: Rivers and Streams \(2000\)\*](#)  
Provides background information on classifying rivers and streams, selecting criteria variables, designing monitoring programs, building a database analyzing nutrient and algal data, deriving regional criteria, and implementing management practices.
- [\*Nutrient Criteria Technical Guidance Manual: Wetlands \(2008\)\*](#)  
Provides background information on how to develop nutrient criteria for wetlands. It does not contain specific numeric nutrient criteria recommendations for wetlands, but it does present the EPA's scientific recommendations on defensible approaches for developing regional nutrient criteria that apply to wetlands.

In addition to technical guidance documents for developing nutrient criteria, the EPA has provided a [toolkit of additional resources](#). This toolkit compiles available EPA resources to facilitate state and authorized tribal adoption of numeric nutrient criteria. It includes information on criteria and WQS development; water quality monitoring, assessment, reporting, and planning; WQBELs and water quality trading; economics and financing; and communications materials.

### 3.7 Biological Water Quality Criteria (Biocriteria)

Biological criteria are numeric values or narrative expressions that describe the desired biological condition of an aquatic community within a water body with an aquatic life use designation. Biological data can be used to verify improvement in water quality in response to regulatory and other improvement efforts and to detect new or continuing degradation of waters. Biological criteria also provide a framework for evaluating the effectiveness of best management practices and management measures for nonpoint source impacts. Numeric biological criteria can provide effective monitoring criteria for evaluation of the health of an aquatic ecosystem.

Evaluation of the biological condition of a water body should include measures of the structure and function of the aquatic community within a specified habitat. Expert knowledge of the system is required for the selection of appropriate biological components and measurement indices. The development and implementation of biological criteria involves the following:

- Selection of surface waters to use in developing reference conditions for each designated use.
- Measurement of the structure and function of aquatic communities in reference surface waters to establish biological criteria.
- Measurement of the physical habitat and other environmental characteristics of the water resource.
- Establishment of a protocol to compare the biological criteria to biota in comparable test waters to determine whether impairment has occurred.

In addition, the EPA supports use of biological data to refine aquatic life designated uses and the development of biological water quality criteria as part of state and authorized tribal WQS. This effort will help states, authorized tribes, and the EPA achieve the biological integrity objective in Section 101 of the [CWA](#) and comply with the statutory requirements under Sections 303 and, for the EPA, 304 (see [A Primer on Using Biological Assessments to Support Water Quality Management \(2011\)](#) and [Practitioner's Guide to the Biological Condition Gradient: A Framework to Describe Incremental Change in Aquatic Ecosystems \(2016\)](#)).

Biological assessments are an evaluation of the condition of a water body using surveys of the structure and function of a community of resident biota (e.g., fish, benthic macroinvertebrates, periphyton, amphibians). See the EPA's [Biological Assessments: Key Terms and Concepts \(2011\)](#). Assessments of habitat condition, both instream and riparian, are typically conducted simultaneously. Such information can reflect the overall ecological integrity of a water body and provide a direct measure of both present and past effects of stressors on the biological integrity of an aquatic ecosystem. The benefit of biological assessment information is based in its capability to do the following:

- Characterize the biological condition of a water body relative to WQS.
- Integrate the cumulative effects of different stressors from multiple sources, thus providing a holistic measure of their aggregate effect.
- Detect aquatic life impairment from unmeasured stressors and unknown sources of impairment.
- Provide field data on biotic response variables to support development of empirical stressor response models.
- Inform water quality and natural resource managers, stakeholders, and the public on the environmental outcomes of the actions taken.

For more information, see the EPA's [Biological Assessment Program Review: Assessing Level of Technical Rigor to Support Water Quality Management \(2013\)](#) and other technical support documents included on the EPA's [Biological Water Quality Criteria webpage](#).

### 3.8 Flow Considerations

The natural flow regime, defined as the characteristic pattern of flow magnitude, timing, duration, frequency, and rate of change, plays a central role in supporting the chemical, physical, and biological integrity of streams and rivers and the services they provide. Hydrologic alteration is a change to a natural flow regime and can include an increase or decrease in water volume, seasonal pulse flow disruption, dramatic variation in water temperature, and other factors. Hydrologic alteration can affect aquatic species' ability to spawn, gather nutrients from a stream system, access high-quality habitat, and more. In contrast, maintaining normal flow regimes may help increase a river's or stream's resilience to a variety of stressors including climate change. [CWA](#) programs can incorporate strategies to protect aquatic ecosystems from the harmful effects of hydrologic alteration, and WQS programs in particular can include water quality criteria for flow to protect designated uses such as aquatic life, recreation, fishing, or shellfish harvesting. Several states and authorized tribes have adopted a narrative form of flow criteria in their WQS. The following provides an example narrative criterion for flow:

*Stream or water body flows shall support the designated aquatic life use.*

In 2016, the EPA and the United States Geological Survey finalized the technical report [Protecting Aquatic Life from Effects of Hydrologic Alteration](#) that provides information on protecting aquatic life from the effect of hydrologic alteration in flowing waters, for interested water quality managers and other stakeholders. The report discusses the natural hydrologic flow regime and potential effects of flow alteration on aquatic life, examples of states that have adopted narrative flow standards, and a flexible, non-prescriptive framework that could be considered by water quality managers and other stakeholders to establish targets for flow that are protective of aquatic life.

### 3.9 Sediment Benchmarks

Sediments are loose particles of sand, clay, silt, and other substances that settle at the bottom of a water body. They come from eroding soil and from decomposing plants and animals. Wind, water, and ice often carry these particles great distances. Many of the sediments in our rivers, lakes, and oceans have been contaminated by pollutants.

Suspended and bedded sediments (SABS) are defined by the EPA as particulate organic and inorganic matter that suspends in or is carried by the water and/or accumulates in a loose, unconsolidated form on the bottom of natural water bodies. This includes the frequently used terms of clean sediment, suspended sediment, total suspended solids, bedload, turbidity, or eroded materials. SABS in excessive amounts constitute a major ecosystem stressor and are a leading cause of waterbody impairment.

Contaminated sediments are soils, sand, organic matter, or minerals that accumulate on the bottom of a water body and contain toxic or hazardous materials that may adversely affect human health or the environment. The EPA has dealt directly with the toxicity of chemicals in sediments in fresh and marine waters through equilibrium partitioning sediment benchmarks (ESBs).



The equilibrium partitioning approach focuses on predicting the chemical interaction between sediments and contaminants. ESBs are the EPA's recommendation of the concentration of a substance in sediment that will not unacceptably affect benthic organisms or their associated designated uses. The EPA chose the equilibrium partitioning approach because it accounts for the varying biological availability of chemicals in different sediments and allows for the incorporation of the appropriate biological effects concentration. This provides for the derivation of benchmarks that are causally linked to the specific chemical, applicable across sediments, and appropriately protective of benthic organisms. ESBs may be useful as a complement to existing sediment assessment tools to help assess the extent of sediment contamination, identify chemicals causing toxicity, and serve as targets for pollutant loading control measures.

The EPA has published technical guidance for developing SABS criteria and technical guidance describing several approaches for developing ESBs for different chemical classes for the protection of aquatic life:

- [\*Developing Water Quality Criteria for Suspended and Bedded Sediments \(SABS\): Potential Approaches \(2003\)\*](#) is a discussion paper prepared for the EPA Science Advisory Board consultation on potential approaches for developing water quality criteria for SABS. The paper introduces SABS and criteria. In addition, it discusses the types and status of criteria that have been or are being used by states and authorized tribes.
- [\*Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks \(ESBs\) for the Protection of Benthic Organisms: PAH Mixtures \(2003\)\*](#) describes an approach for summing the toxicological contributions of mixtures of 34 polycyclic aromatic hydrocarbons (PAHs) to derive concentrations of PAH mixtures in sediment that protect against potential effects to benthic organisms.
- [\*Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks \(ESBs\) For The Protection of Benthic Organisms: Dieldrin \(2003\)\*](#) describes procedures to derive ESBs for the insecticide dieldrin.
- [\*Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks \(ESBs\) for the Protection of Benthic Organisms: Endrin \(2003\)\*](#) describes procedures to derive ESBs for the insecticide endrin.
- [\*Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks \(ESBs\) for the Protection of Benthic Organisms: Metal Mixtures \(Cadmium, Copper, Lead, Nickel, Silver, and Zinc\) \(2005\)\*](#) describes procedures to derive concentrations of metal mixtures in sediment that protect against potential effects on benthic organisms. A procedure for addressing chromium toxicity in sediments is included in an appendix.
- [\*Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks \(ESBs\) for the Protection of Benthic Organisms: Compendium of Tier 2 Values for Nonionic Organics \(2008\)\*](#) describes procedures to derive concentrations for 32 nonionic organic chemicals in sediment that protect against potential effects on benthic organisms.
- [\*Estimation of Biota Sediment Accumulation Factor \(BSAF\) from Paired Observations of Chemical Concentrations in Biota and Sediment \(2009\)\*](#) provides information on methodologies to estimate Biota Sediment Accumulation Factor (BSAF) for nonionic organic chemicals. BSAF is a parameter describing bioaccumulation of sediment-associated organic compounds or metals into tissues of ecological receptors.

- [\*Equilibrium Partitioning Sediment Benchmarks \(ESBs\) for the Protection of Benthic Organisms: Procedures for the Determination of the Freely Dissolved Interstitial Water Concentrations of Nonionic Organics \(2012\)\*](#) provides guidance on procedures to determine the freely dissolved water concentration limits of nonionic organics that protect against potential effects on benthic organisms in sediment interstitial waters.

Achieving water quality goals and maintaining public health and environmental improvements at contaminated sediment sites requires cross-program collaboration, as well as close collaboration with stakeholders. As such, [\*Promoting Water, Superfund and Enforcement Collaboration on Contaminated Sediments, Memorandum from Cynthia Giles, Mathy Stanislaus, and Ken Kopocis \(2015\)\*](#) encourages improvements in communication, coordination, and collaboration among water, Superfund, and enforcement programs when addressing contaminated sediments.

### 3.10 Temperature Water Quality Criteria

Water temperature is an important aspect of protecting aquatic life, such as in cold water habitats where certain species may require cold water to survive. Some waters are naturally warm at certain times of the year due to factors including increased solar radiation and warm air temperature. However, human activities (e.g., removal of streamside vegetation that provides shade, discharges of heat from municipal and industrial facilities, and water withdrawals) can also increase water temperature by increasing the heat load into the water body, reducing the water body's capacity to absorb heat, and eliminating or reducing the amount of groundwater flow, which helps to moderate temperatures. Some human activities can also decrease water temperatures, for example, when cold water is released from the bottom of a thermally stratified reservoir behind a dam.

State and authorized tribal water quality criteria for temperature can play an important role in meeting the [CWA](#) Section 101(a)(2) goal of "protection and propagation of fish, shellfish, and wildlife" by protecting the habitat in which such aquatic life live. The EPA's current 304(a) criteria recommendations for temperature are found in [\*Quality Criteria for Water 1986\*](#), commonly known as the "Gold Book." In addition, the EPA's Region 10 office has developed [guidance](#) on the development of temperature criteria for the protection of salmonids as well as other supporting materials and technical products, including a [primer](#) for identifying cold water refuges to protect and restore thermal diversity in riverine landscapes.

### 3.11 Wildlife Water Quality Criteria

Development of water quality criteria to protect wildlife may be important because terrestrial and avian wildlife species that are dependent on the aquatic food web may be exposed to aquatic contaminants via dietary exposure. This exposure pathway can be particularly important for bioaccumulative pollutants, which accumulate in tissues of aquatic organisms at levels greater than water column concentrations. Bioaccumulation is defined as the accumulation of chemicals in the tissue of organisms through any route including ingestion or direct contact with contaminated water. The [Aquatic Life Guidelines](#) are typically used by the EPA to derive [304\(a\)](#) criteria recommendations intended to protect aquatic life (e.g., fish, benthic invertebrates, zooplankton) from the effects of toxic contaminants, as described in Section 3.5 of this chapter. Those guidelines include a provision intended to protect wildlife that consume aquatic organisms from the bioaccumulation potential of a compound. The Aquatic Life Guidelines recommend deriving final wildlife residue values based on available data.

In 1995, the EPA published the [Water Quality Guidance for the Great Lakes System at 40 CFR Part 132](#) in which Appendix D describes a methodology applicable to the Great Lakes System for developing criteria for the protection of avian and mammalian wildlife from “adverse effects resulting from the ingestion of water and aquatic prey.” That methodology is similar to the methodology used to derive non-cancer human health criteria. Separate wildlife values are derived for birds and mammals using taxonomic class-specific toxicity data and exposure data for five representative Great Lakes wildlife species (bald eagle, herring gull, belted kingfisher, mink, and river otter), which are likely to experience the highest exposures to bioaccumulative contaminants through the aquatic food web in the Great Lakes. In addition, the EPA published the [Great Lakes Water Quality Initiative Technical Support Document for Wildlife Criteria \(1995\)](#), which includes the methodology for deriving wildlife values for pollutants with limited toxicological data to derive a value for only one of the two taxonomic classes specified (birds and mammals).

### 3.12 Water Quality Criteria for Wetlands

Numeric aquatic life [304\(a\)](#) water quality criteria recommendations are designed to be protective of aquatic life for surface waters and are generally applicable to most wetland types. The EPA’s [An Approach for Evaluating Numeric Water Quality Criteria for Wetlands Protection \(1991\)](#) provides an approach, based on the site-specific guidelines, for detecting wetland types that might not be protected by direct application of 304(a) criteria recommendations. The evaluation can be simple for those wetland types for which sufficient water chemistry and species assemblage data are available but will be less useful for wetland types for which these data are not readily available. States and authorized tribes can use the results of this type of evaluation, combined with information on local or regional environmental threats, to prioritize wetland types (and individual criteria) for further site-specific evaluations and/or additional data collection. The EPA recommends close coordination among regulatory agencies, wetland scientists, and criteria experts in developing criteria for wetlands.

In 2008, the EPA published a [wetland-specific Nutrient Criteria Technical Guidance Manual](#) to assist states and authorized tribes in developing numeric nutrient criteria for wetlands. Additionally, the EPA developed [narrative templates for wetlands WQS](#) including a [2016 frequently asked questions document](#) to simplify development of protective WQS for wetlands. States and authorized tribes may choose to develop different types of criteria for wetlands protection, including site-specific numeric or narrative criteria, as long as they are scientifically defensible and protective of the designated uses, and otherwise consistent with [40 CFR 131.11](#) and [CWA](#) section 303(c)(2)(B).

### 3.13 Water Quality Criteria for Priority Pollutants

Section 303(c)(2)(B) of the [CWA](#) and [40 CFR 131.11](#) require states and authorized tribes to adopt numeric water quality criteria for Section 307(a) “[toxic pollutants](#),” as necessary, to support state and authorized tribal designated uses where the discharge or presence of such pollutants in the affected waters could reasonably be expected to interfere with those designated uses adopted by the state or authorized tribe. Where numeric criteria are not available, the state or authorized tribe must adopt criteria based on biological monitoring or assessment methods consistent with the EPA guidance published pursuant to Section 304(a)(8). See Section 3.2.2 of this Chapter.

For regulatory purposes, the EPA has translated the 65 compounds and families of compounds listed under Section 307(a) (which potentially include thousands of specific compounds) into 126 specific toxic substances, which the EPA refers to as "[priority pollutants](#)," and has published national criteria recommendations for most of these pollutants consistent with the authority provided in Section 304(a). The Section 307(a)(1) list of "[toxic pollutants](#)" is codified at [40 CFR 401.15](#). Both the list of priority pollutants and the EPA's 304(a) criteria recommendations for those pollutants are subject to change.

When reviewing applicable WQS during their triennial reviews, in addition to reviewing all applicable criteria, states and authorized tribes must ensure that they have adopted criteria for certain toxic pollutants, as required by Section 303(c)(2)(B). It is important to note that, although a state or authorized tribe may have previously adopted numeric criteria for certain priority pollutants, it may need to adopt numeric criteria for additional priority pollutants in the following situations:

- The EPA has published new or updated 304(a) criteria recommendations for a priority pollutant; and/or
- New information on existing water quality and pollution sources indicates that a priority pollutant for which a state or authorized tribe had not previously adopted criteria could now be reasonably expected to interfere with applicable designated uses.

For additional information and recommendations for implementing Section 303(c)(2)(B), see the following documents:

- [Guidance for State Implementation of Water Quality Standards for CWA Section 303\(c\)\(2\)\(B\) \(1988\)](#).
- [Compliance with CWA Section 303\(c\)\(2\)\(B\), Memorandum from Martha Prothro \(1989\)](#).
- [Option 3 of Section 303\(c\)\(2\)\(B\) Guidance, Memorandum from David K. Sabock \(1990\)](#).
- [Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; States' Compliance, Final Rule \(1992\) \(57 FR 60848\)](#).

### **3.13.1 Water Quality Criteria for Priority Pollutants Based on Biological Monitoring**

For priority pollutants for which the EPA has not published 304(a) numeric water quality criteria, [CWA](#) Section 303(c)(2)(B) requires states and authorized tribes to adopt criteria based on biological monitoring or assessment methods consistent with information published by the EPA in accordance with Section 304(a)(8). The phrase "biological monitoring or assessment methods" includes the following:

- WET control methods.
- Biological criteria methods (discussed in Section 3.7 of this chapter).
- Other methods based on biological monitoring or assessment.

The phrase "biological monitoring or assessment methods" in its broadest sense includes numeric values developed through translator procedures. This broad interpretation of the phrase is consistent with the EPA's policy of applying chemical-specific, biological, and WET methods independently in an integrated pollutant control program. See the [Technical Support Document for Water Quality-based Toxics Control \(1991\)](#) for more information about the integrated approach.

States and authorized tribes should also consider developing protocols to derive and adopt numeric criteria for priority pollutants (or other pollutants) where the EPA has not issued 304(a) criteria recommendations. The state or authorized tribe should consider available laboratory toxicity test data that may be sufficient to support derivation of chemical-specific criteria. Existing data do not necessarily need to be as comprehensive as those recommended in the EPA's [Aquatic Life Guidelines](#) in order for a state or authorized tribe to use its own protocols to derive numeric values. The EPA has described such protocols in the [Water Quality Guidance for the Great Lakes System: Supplementary Implementation Document \(SID\) \(1995\)](#) and in Appendices A and C of [40 CFR 132](#) (Water Quality Guidance for the Great Lakes System). This is particularly important where other components of a state's or authorized tribe's narrative criterion implementation procedure (e.g., WET controls or biological criteria) may not ensure full protection of designated uses. For some pollutants, a combination of chemical-specific and other approaches may be necessary (e.g., pollutants where bioaccumulation in fish tissue or water consumption by humans is a primary concern).

Biologically-based monitoring or assessment methods serve as the basis for control where no specific numeric criteria exist or where calculation or application of pollutant-by-pollutant criteria is infeasible. Also, these methods may serve as a supplemental measurement of WQS attainment in addition to numeric and narrative criteria. The requirement for both numeric criteria and biologically based methods reflects that Section 303(c)(2)(B) requires that states and authorized tribes develop a comprehensive priority pollutant control program regardless of the status of the EPA's 304(a) criteria recommendations.

The WET procedure is a means of assessing and protecting against the aggregate toxic effect of the discharge of pollutants, including point source dischargers of priority pollutants. The procedure is particularly useful for monitoring and controlling the toxicity of complex effluents that may not be well controlled through chemical-specific numeric criteria. For additional information, see the EPA's [WET methods webpage](#).

### **3.14 Water Quality Criteria for Agricultural and Industrial Designated Uses**

Generally, criteria developed for human health and aquatic life will be sufficiently stringent to protect agricultural and industrial designated uses because those uses are generally less sensitive than human health and aquatic life designated uses. There could, nevertheless, be situations where such designated uses may require more stringent criteria to protect them. Salts could be a problem in crop water, for example. Hardness or other contaminants could cause issues at industrial facilities. States and authorized tribes may also establish criteria specifically designed to protect such designated uses and should ensure that they apply the criteria that are protective of the most sensitive use of the water body, as required by [40 CFR 131.11\(a\)](#).

# Water Quality Standards Handbook

## Chapter 4: Antidegradation

*The WQS Handbook does not impose legally binding requirements on the EPA, states, tribes or the regulated community, nor does it confer legal rights or impose legal obligations upon any member of the public. The Clean Water Act (CWA) provisions and the EPA regulations described in this document contain legally binding requirements. This document does not constitute a regulation, nor does it change or substitute for any CWA provision or the EPA regulations.*

# Water Quality Standards Handbook

## CHAPTER 4: ANTIDegradation

### [\(40 CFR 131.12\)](#)

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## CHAPTER 4 ANTIDEGRADATION

This chapter provides guidance on the antidegradation component of water quality standards, its application in conjunction with the other parts of the water quality standards regulation, and its implementation by the States. Antidegradation implementation by the States is based on a set of procedures to be followed when evaluating activities that may impact the quality of the waters of the United States. Antidegradation implementation is an integral component of a comprehensive approach to protecting and enhancing water quality.

### 4.1 History of Antidegradation

The first antidegradation policy statement was released on February 8, 1968, by the Secretary of the U.S. Department of the Interior. It was included in EPA's first Water Quality Standards Regulation (40 CFR 130.17, 40 F.R. 55340–41, November 28, 1975), and was slightly refined and re-promulgated as part of the current program regulation published on November 8, 1983 (48 F.R. 51400, 40 CFR 131.12). Antidegradation requirements and methods for implementing those requirements are minimum conditions to be included in a State's water quality standards. Antidegradation was originally based on the spirit, intent, and goals of the Act, especially the clause ". . . restore and maintain the chemical, physical and biological integrity of the Nation's waters" (101(a)) and the provision of 303(a) that made water quality standards under prior law the "starting point" for CWA water quality requirements. Antidegradation was explicitly incorporated in the CWA through:

- a 1987 amendment codified in section 303(d)(4)(B) requiring satisfaction of antidegradation requirements before making certain changes in NPDES permits; and
- the 1990 Great Lakes Critical Programs Act codified in CWA section 118(c)(2) requiring EPA to publish Great Lakes water quality guidance including antidegradation policies and implementation procedures.

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### 4.2 Summary of the Antidegradation Policy

Section 131.12(a)(1), or "Tier 1," protecting "existing uses," provides the absolute floor of water quality in all waters of the United States. This paragraph applies a minimum level of protection to all waters.

Section 131.12(a)(2), or "Tier 2," applies to waters whose quality exceeds that necessary to protect the section 101(a)(2) goals of the Act. In this case, water quality may not be lowered to less than the level necessary to fully protect the "fishable/swimmable" uses and other existing uses and may be lowered even to those levels only after following all the provisions described in section 131.12(a)(2).

Section 131.12(a)(3), or "Tier 3," applies to Outstanding National Resource Waters (ONRW) where the ordinary use classifications and supporting criteria may not be sufficient or appropriate. As described in the preamble to the Water Quality Standards Regulation, "States may allow some limited activities which result in temporary and short-term changes in water quality," but such changes in

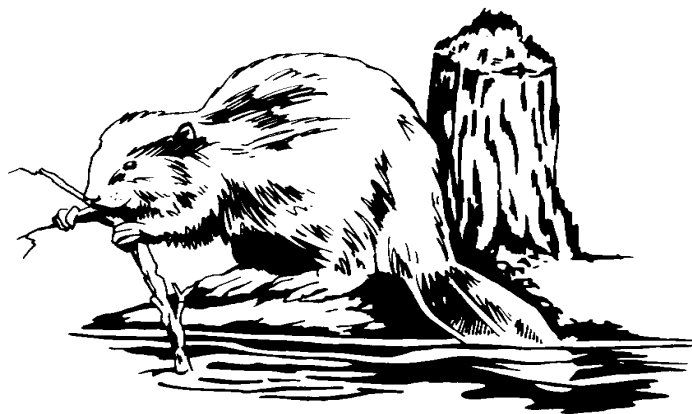


water quality should not impact existing uses or alter the essential character or special use that makes the water an ONRW.

The requirement for potential water quality impairment associated with thermal discharges contained in section 131.12 (a)(4) of the regulation is intended to coordinate the requirements and procedures of the antidegradation policy with those established in the Act for setting thermal discharge limitations. Regulations implementing section 316 may be found at 40 CFR 124.66. The statutory scheme and legislative history indicate that limitations developed under section 316 take precedence over other requirements of the Act.

As the States began to focus more attention on implementing their antidegradation policies, an additional concept was developed by the States, which EPA has accepted even though not directly mentioned in previous EPA guidance or in the regulation. This concept, commonly known as "Tier 2½," is an application of the antidegradation policy that has implementation requirements that are more stringent than for "Tier 2" (high-quality waters), but somewhat less stringent than the prohibition against any lowering of water quality in "Tier 3" (ONRWs). EPA accepts this additional tier in State antidegradation policies because it is clearly a more stringent application of the Tier 2 provisions of the antidegradation policy and, therefore, permissible under section 510 of the CWA.

The supporting rationale that led to the development of the Tier 2½ concept was a concern by the States that the Tier 3 ONRW provision was so stringent that its application would likely prevent States from taking actions in the future that were consistent with important social and economic development on, or upstream of, ONRWs. This concern is a major reason that relatively few water bodies are designated as ONRWs. The Tier 2½ approach allows States to provide a very high level of water quality protection without precluding unforeseen future economic and social development considerations.



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## 4.3 State Antidegradation Requirements

Each State must develop, adopt, and retain a statewide antidegradation policy regarding water quality standards and establish procedures for its implementation through the water quality management process. The State antidegradation policy and implementation procedures must be consistent with the components detailed in 40 CFR 131.12. If not included in the standards regulation of a State, the policy must be specifically referenced in the water quality standards so that the functional relationship between the policy and the standards is clear. Regardless of the location of the policy, it must meet all applicable requirements. States may adopt antidegradation statements more protective than the Federal requirement. The antidegradation implementation procedures specify how the State will determine on a case-by-case basis whether, and to what extent, water quality may be lowered.

State antidegradation policies and implementation procedures are subject to review by the Regional Administrator. EPA has clear authority to review and approve or disapprove and promulgate an antidegradation policy for a State. EPA's review of the implementation procedures is limited to ensuring that procedures are included that describe how the State will implement the required elements of the antidegradation review. EPA may disapprove and federally promulgate all or part of an implementation process for antidegradation if, in the judgment of the Administrator, the State's process (or certain provisions thereof) can be implemented in such a way as to circumvent the intent and purpose of the antidegradation policy. EPA encourages submittal of any amendments to the statement and implementing procedures to the Regional Administrator for pre-adoption review so that the State may take EPA comments into account prior to final action.

If a State's antidegradation policy does not meet the Federal regulatory requirements, either through State action to revise its policy or through revised Federal requirements, the State would be given the opportunity to make its policy consistent with the regulation. If this is not done, EPA has the authority to promulgate the policy for the State pursuant to section 303(c)(4) of the Clean Water Act (see section 6.3, this Handbook).

### UPDATED INFORMATION

[State-Specific Water Quality Standards Effective Under the Clean Water Act](#) - This website provides access to state, authorized tribal and territorial water quality standards, including antidegradation policies, that EPA has approved or are otherwise in effect for Clean Water Act purposes.

#### Federal Rules Involving Antidegradation

[Water Quality Standards for Puerto Rico: Final Rule \(2007\)](#) - This federal register notice promulgated methods to implement Puerto Rico's existing antidegradation policy.

[Advanced Notice of Proposed Rulemaking for Water Quality Standards \(1998\)](#) See pages 36779 to 36787 for an overview of antidegradation policy and EPA's thinking on program development in 1998.

[Final Water Quality Guidance for the Great Lakes System: Final Rule \(1995\)](#) See Appendix E for Antidegradation Provisions.

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## 4.4 Protection of Existing Uses – 40 CFR 131.12(a)(1)

This section requires the protection of existing uses and the level of water quality to protect those uses. An "existing use" can be established by demonstrating that:

- fishing, swimming, or other uses have actually occurred since November 28, 1975; or
- that the water quality is suitable to allow the use to be attained—unless there are physical problems, such as substrate or flow, that prevent the use from being attained.

### UPDATED INFORMATION

[Letter: Mr. Derek Smithee, State of Oklahoma Water Resources Board. Questions and Answers on EPA's Existing Use Policy \(2008\) \(PDF\)](#) - This letter answers Oklahoma's questions on several issues related to existing uses.

An example of the latter is an area where shellfish are propagating and surviving in a biologically suitable habitat and are available and suitable for harvesting although, to date, no one has attempted to harvest them. Such facts clearly establish that shellfish harvesting is an "existing" use, not one dependent on improvements in water quality. To argue otherwise would be to say that the only time an aquatic protection use "exists" is if someone succeeds in catching fish.

Full protection of the existing use requires protection of the entire water body with a few limited exceptions such as certain physical modifications that may so alter a water body that species composition cannot be maintained (see section 4.4.3, this Handbook), and mixing zones (see section 4.4.4, this Handbook). For example, an activity that lowers water quality such that a buffer zone must be established within a previous shellfish harvesting area is inconsistent with the antidegradation policy.

Section 131.12(a)(1) provides the absolute floor of water quality in all waters of the United States. This paragraph applies a minimum level of protection to all waters. However, it is most pertinent to waters having beneficial uses that are less than the section 101(a)(2) goals of the Act. If it can be proven, in that situation, that water quality exceeds that necessary to fully protect the existing use(s) and exceeds water quality standards but is not of sufficient quality to cause a better use to be achieved, then that water quality may be lowered to the level required to fully protect the existing use as long as existing water quality standards and downstream water quality standards are not affected. If this does not involve a change in standards, no public hearing would be required under section 303(c). However, public participation would still be provided in connection with the issuance of a NPDES permit or amendment of a section 208 plan or section 319 program. If, however, analysis indicates that the higher water quality does result in a better use, even if not up to the section 101(a)(2) goals, then the water quality standards must be upgraded to reflect the uses presently being attained (131.10(i)).

If a planned activity will foreseeably lower water quality to the extent that it no longer is sufficient to protect and maintain the existing uses in that water body, such an activity is inconsistent with EPA's

antidegradation policy, which requires that existing uses are to be maintained. In such a circumstance, the planned activity must be avoided or adequate mitigation or preventive measures must be taken to ensure that the existing uses and the water quality to protect them will be maintained.

Section 4.4.1, this Handbook, discusses the determination and protection of recreational "existing" uses, and section 4.4.2, this Handbook, discusses aquatic life protection "existing" uses (of course, many other types of existing uses may occur in a water body).

#### 4.4.1 Recreational Uses

Recreational uses traditionally are divided into primary contact and secondary contact recreation (e.g., swimming vs. boating; that is, recreation "in" or "on" the water.) However, these two broad uses can logically be subdivided into a variety of subcategories (e.g., wading, sailing, power boating, rafting). The water quality standards regulation does not establish a level of specificity that each State must apply in determining what recreational "uses" exist. However, the following principles apply.

- The State selects the level of specificity it desires for identifying recreational existing uses (that is, whether to treat secondary contact recreation as a single use or to define subcategories of secondary recreation). The State has two limitations:
  - the State must be at least as specific as the uses listed in sections 101(a) and 303(c) of the Clean Water Act; and
  - the State must be at least as specific as the written description of the designated use classifications adopted by the State.
- If the State designated use classification system is very specific in describing subcategories of a use, then such specifically defined uses, if they exist, must be protected fully under antidegradation. A State with a broadly written use classification system may, as a matter of policy, interpret its classifications more specifically for determining existing uses—as long as it is done consistently. A State may also redefine its use classification system, subject to the constraints in 40CFR 131.10, to more adequately reflect existing uses.
- If the use classification system in a State is defined in broad terms such as primary contact recreation, secondary contact recreation, or boating, then it is a State determination whether to allow changes in the type of primary or secondary contact recreation or boating activity that would occur on a specific water body as long as the basic use classification is met. For example, if a State defines a use simply as "boating," it is the State's decision whether to allow something to occur that would change the type of boating from canoeing to power boating as long as the resulting water quality allows the "boating" use to be met. (The public record used originally to establish the use may provide a clearer indication of the use intended to be attained and protected by the State.)

The rationale is that the required water quality will allow a boating use to continue and that use meets the goal of the Act. Water quality is the key. This interpretation may allow a State to change

activities within a specific use category but it does not create a mechanism to remove use classifications; this latter action is governed solely by the provisions of the standards regulation (CWA section 131.10(g)).

One situation where EPA might conceivably be called upon to decide what constitutes an existing use is where EPA is writing an NPDES permit. EPA has the responsibility under CWA section 301(b)(1)(C) to determine what is needed to protect existing uses under the State's antidegradation requirement, and accordingly may define "existing uses" or interpret the State's definition to write that permit if the State has not done so. Of course, EPA's determination would be subject to State section 401 certification in such a case.

#### **4.4.2 Aquatic Life/Wildlife Uses**

No activity is allowable under the antidegradation policy which would partially or completely eliminate any existing use whether or not that use is designated in a State's water quality standards. The aquatic protection use is a broad category requiring further explanation. Non-aberrational resident species must be protected, even if not prevalent in number or importance. Water quality should be such that it results in no mortality and no significant growth or reproductive impairment of resident species. Any lowering of water quality below this full level of protection is not allowed.

A State may develop subcategories of aquatic protection uses but cannot choose different levels of protection for like uses. The fact that sport or commercial fish are not present does not mean that the water may not be supporting an aquatic life protection function. An existing aquatic community composed entirely of invertebrates and plants, such as may be found in a pristine alpine tributary stream, should still be protected whether or not such a stream supports a fishery.

Even though the shorthand expression "fishable/swimmable" is often used, the actual objective of the Act is to "restore and maintain the chemical, physical, and biological integrity of our Nation's waters" (section 101(a)). The term "aquatic life" would more accurately reflect the protection of the aquatic community that was intended in section 101(a)(2) of the Act.

Section 131.12(a)(1) states, "Existing instream water uses and level of water quality necessary to protect the existing uses shall be maintained and protected." For example, while sustaining a small coldwater fish population, a stream does not support an existing use of a "coldwater fishery." The existing stream temperatures are unsuitable for a thriving coldwater fishery. The small marginal population is an artifact and should not be employed to mandate a more stringent use (true coldwater fishery) where natural conditions are not suitable for that use.

A use attainability analysis or other scientific assessment should be used to determine whether the aquatic life population is in fact an artifact or is a stable population requiring water quality protection. Where species appear in areas not normally expected, some adaptation may have occurred and site-specific criteria may be appropriately developed. Should the coldwater fish population consist of a threatened or endangered species, it may require protection under the Endangered Species Act. Otherwise, the stream need only be protected as a warmwater fishery.

### 4.4.3 Existing Uses and Physical Modifications

A literal interpretation of 40 CFR 131.12(a)(1) could prevent certain physical modifications to a water body that are clearly allowed by the Clean Water Act, such as wetland fill operations permitted under section 404 of the Clean Water Act. EPA interprets section 131.12(a)(1) of the antidegradation policy to be satisfied with regard to fills in wetlands if the discharge did not result in "significant degradation" to the aquatic ecosystem as defined under section 230.10(c) of the section 404(b)(1) Guidelines.

The section 404(b)(1) Guidelines state that the following effects contribute to significant degradation, either individually or collectively:

... significant adverse effects on (1) human health or welfare, including effects on municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites (e.g., wetlands); (2) on the life stages of aquatic life and other wildlife dependent on aquatic ecosystems, including the transfer, concentration, or spread of pollutants or their byproducts beyond the site through biological, physical, or chemical process; (3) on ecosystem diversity, productivity, and stability, including loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy; or (4) on recreational, aesthetic, and economic values.

These Guidelines may be used by States to determine "significant degradation" for wetland fills. Of course, the States are free to adopt stricter requirements for wetland fills in their own antidegradation policies, just as they may adopt any other requirement more stringent than Federal law requires. For additional information on the linkage between water quality standards and the section 404 program, see Appendix D.



If any wetlands were found to have better water quality than "fishable/swimmable," the State would be allowed to lower water quality to the no significant degradation level as long as the requirements of section 131.12(a)(2) were followed. As for the ONRW provision of antidegradation (131.12(a)(3)), there is no difference in the way it applies to wetlands and other water bodies.

#### 4.4.4 Existing Uses and Mixing Zones

Mixing zones are another instance when the entire extent of the water body is not required to be given full existing use protection. The area within a properly designated mixing zone (see section 5.1) may have altered benthic habitat and a subsequent alteration of the portions of the aquatic community. Any effect on the existing use must be limited to the area of the regulatory mixing zone.

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### 4.5 Protection of Water Quality in High-Quality Waters – 40 CFR 131.12(a)(2)

This section provides general program guidance in the development of procedures for the maintenance and protection of water quality where the quality of the water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water. Water quality in "high-quality waters" must be maintained and protected as prescribed in section 131.12(a)(2) of the WQS regulation.

High-quality waters are those whose quality exceeds that necessary to protect the section 101(a)(2) goals of the Act, regardless of use designation. All parameters do not need to be better quality than the State's ambient criteria for the water to be deemed a "high-quality water." EPA believes that it is best to apply antidegradation on a parameter-by-parameter basis. Otherwise, there is potential for a large number of waters not to receive antidegradation protection, which is important to attaining the goals of the Clean Water Act to restore and maintain the integrity of the Nation's waters. However, if a State has an official interpretation that differs from this interpretation, EPA will evaluate the State interpretation for conformance with the statutory and regulatory intent of the antidegradation policy. EPA has accepted approaches that do not use a strict pollutant-by-pollutant basis (USEPA, 1989c).

In "high-quality waters," under 131.12(a)(2), before any lowering of water quality occurs, there must be an antidegradation review consisting of:

- a finding that it is necessary to accommodate important economic or social development in the area in which the waters are located (this phrase is intended to convey a general concept regarding what level of social and economic development could be used to justify a change in high-quality waters);
- full satisfaction of all intergovernmental coordination and public participation provisions (the intent here is to ensure that no activity that will cause water quality to decline in existing high-quality waters is undertaken without adequate public review and intergovernmental coordination); and

#### UPDATED INFORMATION

[Memo: Tier 2 Antidegradation Reviews and Significance Thresholds \(2005\) \(PDF\)](#) -

Recommendation regarding significance thresholds and lowering of water quality in high quality waters in the context of tier 2 antidegradation reviews.

[Interim Economic Guidance for Water Quality Standards \(1995\)](#) – This document provides guidance for use by states and tribes in understanding the economic factors that may be considered, and the types of tests that can be used to determine if a designated use cannot be attained, if a variance can be granted, or if degradation of high-quality water is warranted.

- assurance that the highest statutory and regulatory requirements for point sources, including new source performance standards, and best management practices for nonpoint source pollutant controls are achieved (this requirement ensures that the limited provision for lowering water quality of high-quality waters down to "fishable/swimmable" levels will not be used to undercut the Clean Water Act requirements for point source and nonpoint source pollution control; furthermore, by ensuring compliance with such statutory and regulatory controls, there is less chance that a lowering of water quality will be sought to accommodate new economic and social development).

In addition, water quality may not be lowered to less than the level necessary to fully protect the "fishable/swimmable" uses and other existing uses. This provision is intended to provide relief only in a few extraordinary circumstances where the economic and social need for the activity clearly outweighs the benefit of maintaining water quality above that required for "fishable/swimmable" water, and both cannot be achieved. The burden of demonstration on the individual proposing such activity will be very high. In any case, moreover, the existing use must be maintained and the activity shall not preclude the maintenance of a "fishable/swimmable" level of water quality protection.

The antidegradation review requirements of this provision of the antidegradation policy are triggered by any action that would result in the lowering of water quality in a high-quality water. Such activities as new discharges or expansion of existing facilities would presumably lower water quality and would not be permissible unless the State conducts a review consistent with the previous paragraph. In addition, no permit may be issued, without an antidegradation review, to a discharger to high-quality waters with effluent limits greater than actual current loadings if such loadings will cause a lowering of water quality (USEPA, 1989c).

Antidegradation is not a "no growth" rule and was never designed or intended to be such. It is a policy that allows public decisions to be made on important environmental actions. Where the State intends to provide for development, it may decide under this section, after satisfying the requirements for intergovernmental coordination and public participation, that some lowering of water quality in "high-quality waters" is necessary to accommodate important economic or social development. Any such lower water quality must protect existing uses fully, and the State must assure that the highest statutory and regulatory requirement for all new and existing point sources and all cost-effective and reasonable BMPs for nonpoint source control are being achieved on the water body.

Section 131.12(a)(2) does not REQUIRE a State to establish BMPs for nonpoint sources where such BMP requirements do not exist. We interpret Section 131.12(a)(2) as REQUIRING States to adopt an antidegradation policy that includes a provision that will assure that all cost-effective and reasonable BMPs established under State authority are implemented for nonpoint sources before the State authorizes degradation of high quality waters by point sources (see USEPA, 1994a.)



Section 131.12(a)(2) does not mandate that States establish controls on nonpoint sources. The Act leaves it to the States to determine what, if any, controls on nonpoint sources are needed to provide for attainment of State water quality standards (See CWA Section 319.) States may adopt enforceable requirements, or voluntary programs to address nonpoint source pollution. Section 40 CFR 131.12(a)(2) does not require that States adopt or implement best management practices for nonpoint sources prior to allowing point source degradation of a high quality water. However, States that have adopted nonpoint source controls must assure that such controls are properly implemented before authorization is granted to allow point source degradation of water quality.

The rationale behind the antidegradation regulatory statement regarding achievement of statutory requirements for point sources and all cost effective and reasonable BMPs for nonpoint sources is to assure that, in high quality waters, where there are existing point or nonpoint source control compliance problems, proposed new or expanded point sources are not allowed to contribute additional pollutants that could result in degradation. Where such compliance problems exist, it would be inconsistent with the philosophy of the antidegradation policy to authorize the discharge of additional pollutants in the absence of adequate assurance that any existing compliance problems will be resolved.

EPA's regulation also requires maintenance of high quality waters except where the State finds that degradation is "necessary to accommodate important economic and social development in the area in which the waters are located." (40 CFR Part 131.12(a) (Emphasis added)). We believe this phrase should be interpreted to prohibit point source degradation as unnecessary to accommodate important economic and social development if it could be partially or completely prevented through implementation of existing State-required BMPs.

EPA believes that its antidegradation policy should be interpreted on a pollutant-by-pollutant and waterbody-by-waterbody basis. For example, degradation of a high quality waterbody by a proposed new BOD source prior to implementation of required BMPs on the same waterbody that are related to BOD loading should not be allowed. However, degradation by the new point source of BOD should not be barred solely on the basis that BMPs unrelated to BOD loadings, or which relate to other waterbodies, have not been implemented.

We recommend that States explain in their antidegradation policies or procedures how, and to what extent, the State will require implementation of otherwise non-enforceable (voluntary) BMPs before allowing point source degradation of high quality waters. EPA understands this recommendation exceeds the Federal requirements discussed in this guidance. For example, nonpoint source management plans being developed under section 319 of the Clean Water Act are likely to identify potential problems and certain voluntary means to correct those problems. The State should consider how these provisions will be implemented in conjunction with the water quality standards program.

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## 4.6 Applicability of Water Quality Standards to Nonpoint Sources Versus Enforceability of Controls

The requirement in Section 131.21(a)(2) to implement existing nonpoint source controls before allowing degradation of a high quality water, is a subset of the broader issue of the applicability of water quality standards versus the enforceability of controls designed to implement standards. A discussion of the broader issue is included here with the intent of further clarifying the nonpoint source antidegradation question. In the following discussion, the central message is that water quality standards apply broadly and it is inappropriate to exempt whole classes of activities from standards and thereby invalidate that broader, intended purpose of adopted State water quality standards.

Water quality standards serve the dual function of establishing water quality goals for a specific waterbody and providing the basis for regulatory controls. Water quality standards apply to both point and nonpoint sources. There is a direct Federal implementation mechanism to regulate point sources of pollution but no parallel Federal regulatory process for nonpoint sources. Under State law, however, States can and do adopt mandatory nonpoint source controls.

State water quality standards play the central role in a State's water quality management program, which identifies the overall mechanism States use to integrate the various Clean Water Act water quality control elements into a coherent management framework. This includes, for example: (1) setting and revising water quality standards for all surface waterbodies, (2) monitoring water quality to provide information upon which water quality-based decisions will be made, progress evaluated, and success measured, (3) preparing a water quality inventory report under section 305(b) which documents the status of the State's water quality, (4) developing a water quality management plan which lists the standards, and prescribes the regulatory and construction activities necessary to meet the standards, (5) calculating total maximum daily loads and wasteload allocations for point sources of pollution and load allocations for nonpoint sources of pollution in the implementation of standards, (6) implementing the section 319 management plan which outlines the State's control strategy for nonpoint sources of pollution, and (7) developing permits under Section 402.

Water quality standards describe the desired condition of the aquatic environment, and, as such, reflect any activity that affects water quality. Water quality standards have broad application and use in evaluating potential impacts of water quality from a broad range of causes and sources and are not limited to evaluation of effects caused by the discharge of pollutants from point sources. In this regard, States should have in place methods by which the State can determine whether or not their standards have been achieved (including uses, criteria, and implementation of an antidegradation policy). Evaluating attainment of standards is basic to successful application of a State's water quality standards program. In the broad application of standards, these evaluations are not limited to those activities which are directly controlled through a mandatory process. Rather, these evaluations are an important component of a State's water quality management program regardless of whether or not an enforcement procedure is in place for the activity under review.

Water quality standards are implemented through State or EPA-issued water quality-based permits and through State nonpoint source control programs. Water quality standards are implemented through enforceable NPDES permits for point sources and through the installation and maintenance of BMPs for nonpoint sources. Water quality standards usually are not considered self-enforcing except where they are established as enforceable under State law. Application of water quality standards in the overall context of a water quality management program, however, is not limited to activities for which there are enforceable implementation mechanisms.

In simple terms, applicability and enforceability are two distinctly separate functions in the water quality standards program. Water quality standards are applicable to all waters and in all situations, regardless of activity or source of degradation. Implementation of those standards may not be possible in all circumstances; in such cases, the use attainability analysis may be employed. In describing the desired condition of the environment, standards establish a benchmark against which all activities which might affect that desired condition are, at a minimum, evaluated. Standards serve as the basis for water quality monitoring and there is value in identifying the source and cause of a exceedance even if, at present, those sources of impact are not regulated otherwise controlled.

It is acceptable for a State to specify particular classes of activities for which no control requirements have been established in State law. It is not acceptable, however, to specify that standards do not apply to particular classes of activities (e.g. for purposes of monitoring and assessment). To do so would abrogate one of the primary functions of water quality standards.

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#### **4.7 Outstanding National Resource Waters (ONRW) – 40 CFR 131.12(a)(3)**

Outstanding National Resource Waters (ONRWs) are provided the highest level of protection under the antidegradation policy. The policy provides for protection of water quality in high-quality waters that constitute an ONRW by prohibiting the lowering of water quality. ONRWs are often regarded as highest quality waters of the United States: That is clearly the thrust of 131.12(a)(3). However, ONRW designation also offers special protection for waters of "exceptional ecological significance." These are water bodies that are important, unique, or sensitive ecologically, but whose water quality, as measured by the traditional parameters such as dissolved oxygen or pH, may not be particularly high or whose characteristics cannot be adequately described by these parameters (such as wetlands).

The regulation requires water quality to be maintained and protected in ONRWs. EPA interprets this provision to mean no new or increased discharges to ONRWs and no new or increased discharge to tributaries to ONRWs that would result in lower water quality in the ONRWs. The only exception to this prohibition, as discussed in the preamble to the Water Quality Standards Regulation (48 F.R. 51402), permits States to allow some limited activities that result in temporary and short-term changes in the water quality of ONRW. Such activities must not permanently degrade water quality or result in water quality lower than that necessary to protect the existing uses in the ONRW. It is difficult to give an exact definition of "temporary" and "short-term" because of the variety of activities that might be considered. However, in rather broad terms, EPA's view of temporary is weeks and months, not years. The intent of EPA's provision clearly is to limit water quality degradation to the shortest possible time. If a construction activity is involved, for example,

temporary is defined as the length of time necessary to construct the facility and make it operational. During any period of time when, after opportunity for public participation in the decision, the State allows temporary degradation, all practical means of minimizing such degradation shall be implemented. Examples of situations in which flexibility is appropriate are listed in Exhibit 4-1.

**Exhibit 4-1. Examples of Allowable Temporary Lowering of Water Quality in Outstanding National Resource Waters**

<p>Example 1. A national park wishes to replace a defective septic tank–drainfield system in a campground. The campground is located immediately adjacent to a small stream with the ONRW use designation.</p> <ul style="list-style-type: none"><li>• Under the regulation, the construction could occur if best management practices were scrupulously followed to minimize any disturbance of water quality or aquatic habitat.</li></ul>
<p>Example 2. Same situation except the campground is served by a small sewage treatment plant already discharging to the ONRW. It is desired to enlarge the treatment system and provide higher levels of treatment.</p> <ul style="list-style-type: none"><li>• Under the regulation, this water–quality–enhancing action would be permitted if there was only temporary increase in sediment and, perhaps, in organic loading, which would occur during the actual construction phase.</li></ul>
<p>Example 3. A National forest with a mature, second growth of trees which are suitable for harvesting, with associated road repair and re–stabilization. Streams in the area are designated as ONRW and support trout fishing.</p> <ul style="list-style-type: none"><li>• The regulation intends that best management practices for timber harvesting be followed and might include preventive measures more stringent than for similar logging in less environmentally sensitive areas. Of course, if the lands were being considered for designation as wilderness areas or other similar designations, EPA’s regulation should not be construed as encouraging or condoning timbering operations. The regulation allows only temporary and short–term water quality degradation while maintaining existing uses or new uses consistent with the purpose of the management of the ONRW area.</li></ul>

Other examples of these types of activities include maintenance and/or repair of existing boat ramps or boat docks, restoration of existing sea walls, repair of existing stormwater pipes, and replacement or repair of existing bridges.

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## 4.8 Antidegradation Application and Implementation

Any one or a combination of several activities may trigger the antidegradation policy analysis. Such activities include a scheduled water quality standards review, the establishment of new or revised load allocations, waste load allocations, total maximum daily loads, issuance of NPDES permits, and the demonstration of need for advanced treatment or request by private or public agencies or individuals for a special study of the water body.

Nonpoint source activities are not exempt from the provisions of the antidegradation policy. The language of section 131.12 (a)(2) of the regulation: "Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control . . ." reflects statutory provisions of the Clean Water Act. While it is true that the Act does not establish a federally enforceable program for nonpoint sources, it clearly intends that the BMPs developed and approved under sections 205(j), 208, 303(e), and 319 be aggressively implemented by the States.

### 4.8.1 Antidegradation, Load Allocation, Waste Load Allocation, Total Maximum Daily Load, and Permits

In developing or revising a load allocation (LA), waste load allocation (WLA), or total maximum daily load (TMDL) to reflect new information or to provide for seasonal variation, the antidegradation policy, as an integral part of the State water quality standards, must be applied as discussed in this section.

The TMDL/WLA/LA process distributes the allowable pollutant loadings to a water body. Such allocations also consider the contribution to pollutant loadings from nonpoint sources. This process must reflect applicable State water quality standards including the antidegradation policy. No waste load allocation can be developed or NPDES permit issued that would result in standards being violated. With respect to antidegradation, that means existing uses must be protected, water quality may not be lowered in ONRWs, and in the case of waters whose quality exceeds that necessary for the section 101(a)(2) goals of the Act, an activity cannot result in a lowering of water quality unless the applicable public participation, intergovernmental review, and baseline control requirements of the antidegradation policy have been met. Once the LA, WLA, or TMDL revision is completed, the resulting permits must incorporate discharge limitations based on this revision.

When a pollutant discharge ceases for any reason, the waste load allocations for the other dischargers in the area may be adjusted to reflect the additional loading available consistent with the antidegradation policy under two circumstances:

- In "high-quality waters" where after the full satisfaction of all public participation and intergovernmental review requirements, such adjustments are considered necessary to accommodate important economic or social development, and the "threshold"

level requirements (required point and nonpoint source controls) are met.

- In less than "high-quality waters," when the expected improvement in water quality (from the ceased discharge) would not cause a better use to be achieved.

The adjusted loads still must meet water quality standards, and the new waste load allocations must be at least as stringent as technology-based limitations. Of course, all applicable requirements of the section 402 NPDES permit regulations would have to be satisfied before a permittee could increase its discharge.

If a permit is being renewed, reissued or modified to include less stringent limitations based on the revised LA/WLA/TMDL, the same antidegradation analysis applied during the LA/WLA/TMDL stage would apply during the permitting stage. It would be reasonable to allow the showing made during the LA/WLA/TMDL stage to satisfy the antidegradation showing at the permit stage. Any restrictions to less stringent limits based on antibacksliding would also apply.

If a State issues an NPDES permit that violates the required antidegradation policy, it would be subject to a discretionary EPA veto under section 402(d) or to a citizen challenge. In addition to actions on permits, any waste load allocations and total maximum daily loads violating the antidegradation policy are subject to EPA disapproval and EPA promulgation of a new waste load allocation/total maximum daily load under section 303(d) of the Act. If a significant pattern of violation was evident, EPA could constrain the award of grants or possibly revoke any Federal permitting capability that had been delegated to the State. Where EPA issues an NPDES permit, EPA will, consistent with its NPDES regulations, add any additional or more stringent effluent limitations required to ensure compliance with the State antidegradation policy incorporated into the State water quality standards. If a State fails to require compliance with its antidegradation policy through section 401 certification related to permits issued by other Federal agencies (e.g., a Corps of Engineers section 404 permit), EPA could comment unfavorably upon permit issuance. The public, of course, could bring pressure upon the permit issuing agency.

For example applications of antidegradation in the WLA and permitting process, see Exhibit 4–2.

**Exhibit 4–2. Examples of the Application of Antidegradation in the Waste Load/Load Allocation and NPDES Permitting Process**

**Example 1.** Several facilities on a stream segment discharge phosphorus-containing wastes. Ambient phosphorus concentrations meet the designated class B (non-fishable/swimmable) standards, but barely. Three dischargers achieve elimination by developing land treatment systems. As a result, actual water quality improves (i.e., phosphorus levels decline) but not quite to the level needed to meet class A (fishable/swimmable) standards. Can the remaining dischargers now be allowed to increase their phosphorus discharge without an antidegradation analysis with the result that water quality declines (phosphorus levels increase) to previous levels?

- Nothing in the water quality standards regulation explicitly prohibits this. Of course, changes in their NPDES permit limits may be subject to non-water quality constraints, such as BPT, BAT, or the NPDES antibacksliding provisions, which may restrict the increased loads.

**Example 2.** Suppose, in the above situation, water quality improves to the point that actual water quality now meets class A requirements. Is the answer different?

- Yes. The standards must be upgraded (see section 2.8).

**Example 3.** As an alternative case, suppose phosphorus loadings go down and water quality improves because of a change in farming practices (e.g., initiation of a successful nonpoint source program.) Are the above answers the same?

- Yes. Whether the improvement results from a change in point or nonpoint source activity is immaterial to how any aspect of the standards regulation operates. Section 131.10(d) clearly indicates that uses are deemed attainable if they can be achieved by "... cost-effective and reasonable best management practices for nonpoint source control." Section 131.12(a)(2) of the antidegradation policy contains essentially the same wording.

Antidegradation, as with other water quality standards activities, requires public participation and intergovernmental coordination to be an effective tool in the water quality management process. 40 CFR 131.12(a)(2) contains explicit requirements for public participation and intergovernmental coordination when determining whether to allow lower water quality in high-quality waters. Nothing in either the water quality standards or the waste load allocation regulations requires the same degree of public participation or intergovernmental coordination for such non-high-quality waters as is required for high-quality waters. However public participation would still be provided in connection with the issuance of a NPDES permit or amendment of a 208 plan. Also, if the action that causes reconsideration of the existing waste loads (such as dischargers withdrawing from the area) will result in an improvement in water quality that makes a better use attainable, even if not up to the "fishable/swimmable" goal, then the water quality standards must be upgraded and full public review is required for any action affecting changes in standards.

Although not specifically required by the standards regulation between the triennial reviews, we recommend that the State conduct a use attainability analysis to determine if water quality improvement will result in attaining higher uses than currently designated in situations where significant changes in waste loads are expected.

The antidegradation public participation requirement may be satisfied in several ways. The State may hold a public hearing or hearings. The State may also satisfy the requirement by providing public notice and the opportunity for the public to request a hearing. Activities that may affect several water bodies in a river basin or sub-basin may be considered in a single hearing. To ease the resource burden on both the State and public, standards issues may be combined with hearings on environmental impact statements, water management plans, or permits. However, if this is done, the public must be clearly informed that possible changes in water quality standards are being considered along with other activities. It is inconsistent with the water quality standards regulation to "back-door" changes in standards through actions on EIS's, waste load allocations, plans, or permits.



# **Water Quality Standards Handbook**

## **Chapter 5: General Policies**

# Water Quality Standards Handbook

## Chapter 5: General Policies

[\(40 CFR 131.13\)](#)

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## Introduction

As specified in [40 CFR 131.13](#), states and authorized tribes may, at their discretion, adopt certain policies into their water quality standards (WQS) that generally affect how their WQS are applied or implemented.<sup>1</sup> Examples of such general policies include those affecting mixing zones, critical low flows, and WQS variances. As the regulation indicates, states and tribes are not required to adopt general policies. However, if a state or tribe chooses to adopt a general policy, such policies are subject to EPA review and approval or disapproval under Section 303(c) of the [Clean Water Act \(CWA\)](#) if they constitute new or revised WQS (see [Chapter 1](#) of this Handbook). This chapter provides an overview of three types of general WQS policies. In particular, Section 5.1 of this chapter discusses mixing zones, Section 5.2 discusses critical low flows, and Section 5.3 discusses variances.

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## 5.1 Mixing Zones

A mixing zone is a limited area or volume of water where initial dilution of a discharge takes place and where certain numeric water quality criteria may be exceeded. The [CWA](#) does not require that all criteria be met at the exact point where pollutants are discharged into a receiving water prior to the mixing of such pollutants with the receiving water. Sometimes it is possible to expose aquatic organisms to a pollutant concentration above a criterion for a short duration within a limited, clearly defined area of a waterbody while still maintaining the designated use of the waterbody as a whole. Where this is the case, a state or authorized tribe may find it appropriate to allow ambient concentrations of a pollutant above the criterion in small areas near point-source outfalls (i.e., mixing zones).

Mixing zones do not constitute new state or tribal criteria or changes to the state- or tribe-adopted and EPA-approved criteria. Therefore, the narrative and/or numeric criteria for the waterbody are still the applicable criteria within the boundaries of the mixing zone. A mixing zone simply authorizes an applicable criterion to be exceeded within a defined area of the waterbody while still protecting the designated use of the waterbody as a whole. Since 1983, the guidance in this Handbook has described mixing zones as areas where criteria may be exceeded rather than areas where criteria do not apply.

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<sup>1</sup> Throughout this document, the term “states” means the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the 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.

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By authorizing a mixing zone, states and tribes allow some portion of the waterbody to mix with and dilute particular wastewater discharges before evaluating whether the waterbody as a whole is meeting its criteria. In addition to the WQS regulation at [40 CFR 131.13](#) described above, the use of dilution is supported by the National Pollutant Discharge Elimination System (NPDES) permitting regulation at [40 CFR 122.44\(d\)\(1\)\(ii\)](#), which requires the permitting authority to consider, where appropriate, “the dilution of the effluent in the receiving water” when determining whether a discharge causes, has the reasonable potential to cause, or contributes to an instream excursion above a criterion. Depending on the state or tribal WQS and implementation policies, a consideration of dilution could be expressed in the form of a dilution allowance or a mixing zone. A dilution allowance typically is expressed as the flow or portion of the flow of a river or stream and is typically applied in flowing waters where rapid and complete mixing occurs. A mixing zone is typically applied in any waterbody type in which incomplete mixing occurs. For more information, see [Chapter 6 of the NPDES Permit Writers’ Manual \(2010\)](#).

While mixing zones serve to dilute concentrations of pollutants in effluent discharges, they also allow increases in the mass loading of the pollutant to the waterbody (more so than would occur if no mixing zone were allowed). Therefore, if not applied appropriately, a mixing zone could adversely affect mobile species passing through the mixing zone as well as less mobile species (e.g., benthic communities) in the immediate vicinity of the discharge. Because of these and other factors, mixing zones should be applied carefully so that they do not result in impairment of the designated use of the waterbody as a whole or impede progress toward the CWA goals of restoring and maintaining the physical, chemical, and biological integrity of the Nation’s waters. Keeping this in mind, a state or tribe has the discretion to choose whether to authorize mixing zones and adopt a mixing zone policy. However, as described below, if a state or tribe chooses to adopt a mixing zone policy, such a policy is generally considered a new or revised WQS that must be adopted into state or tribal law and approved by the EPA before it is effective for CWA purposes.

An important note is that “mixing zone” is used in multiple ways. A *mixing zone policy* is a legally binding state or tribal policy that is adopted into WQS and describes the general characteristics of and requirements associated with mixing zones without taking into account site-specific information. The EPA generally views such mixing zone policies as constituting new or revised WQS that require EPA review and approval or disapproval under Section 303(c) of the CWA. Consistent with the four-part test described in [What is a New or Revised Water Quality Standard Under CWA Section 303\(c\)? Frequently Asked Questions \(2012\)](#) and [Chapter 1](#) of this Handbook, a state or tribal mixing zone policy is a legally binding provision that is adopted into state or tribal law (part one), and it addresses the criteria component of WQS (part two). Additionally, a mixing zone policy expresses a desired condition in the waterbody to allow flexibility in meeting the applicable criteria within certain areas of the waterbody (part three), and if it is a new provision or revises an existing policy (part four), it clearly meets the requirements to be a new or revised WQS.

On the other hand, an *individual, site-specific mixing zone* is authorized for a particular point-source discharge in accordance with a state or tribal mixing zone policy and accounts for the site-specific characteristics of a particular discharge and receiving water. An individual mixing zone is defined and implemented through the NPDES permitting process. The EPA does not view individual mixing zones

as constituting new or revised WQS requiring EPA review under Section 303(c). Like a mixing zone policy, an individual mixing zone is a legally binding provision that is established pursuant to state or tribal law (part one), and it addresses the criteria component of WQS (part two). However, unlike a mixing zone policy, an individual mixing zone does not express or establish a desired condition in the waterbody (part three). Instead, the individual mixing zone is used to establish appropriate water quality-based effluent limits (WQBELs) for a specific discharger's NPDES permit. An individual mixing zone also does not establish a new provision or revise an existing provision (part four). Rather, it implements a WQS (i.e., the state or tribal mixing zone policy) for a specific discharger using site-specific information.

Additionally, any time an effluent is discharged into a receiving water, there will be a zone of *actual or physical mixing* in which the discharge and receiving water naturally mix regardless of whether a mixing zone, in the regulatory sense, has been authorized. Such actual mixing is described using field studies and a water quality model and is used in establishing an individual, site-specific mixing zone for a particular discharge.

The authorization of mixing zones under incompletely mixed discharge and receiving water situations pre-dates the CWA. The EPA's current mixing zone guidance, contained in this Handbook, the [Technical Support Document for Water Quality-based Toxics Control \(TSD\) \(1991\)](#), and the [NPDES Permit Writers' Manual \(2010\)](#), evolved from previous guidance from the EPA and its predecessor agencies on the use of mixing zones as a regulatory tool to address the incomplete mixing of wastewater discharges in receiving waters. This Handbook describes the EPA's recommendations for state and tribal mixing zone policies. The other two documents listed above describe the technical and permitting aspects of defining individual, site-specific mixing zones for point-source discharges during the NPDES permitting process. Additional information on mixing zones can also be found in the EPA's [Compilation of EPA Mixing Zone Documents \(2006\)](#) and [Advanced Notice of Proposed Rulemaking for Water Quality Standards \(1998\)](#).

### 5.1.1 Recommended Contents of State and Tribal Mixing Zone Policies

The EPA recommends that states and authorized tribes adopt, at a minimum, a definitive statement into their WQS specifying whether the state or tribe intends to authorize mixing zones. Consistent with the discussion above, where a mixing zone is authorized, water quality criteria are met at the edge of the mixing zone during critical low-flow conditions (which are described in Section 5.2 of this chapter) so that the designated use of the waterbody as a whole is protected. If a state or tribe chooses to adopt a mixing zone policy, such a policy should ensure the following:

- Mixing zones do not impair the designated use of the waterbody as a whole.
- Pollutant concentrations within the mixing zone are not lethal to organisms passing through the mixing zone.<sup>2</sup>

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<sup>2</sup> Lethality is a function of the magnitude of a pollutant concentration and the duration an organism is exposed to that concentration. Section 4.3.3 of the [TSD \(1991\)](#) describes various

- Pollutant concentrations within the mixing zone do not cause significant human health risks considering likely pathways of exposure.
- Mixing zones do not endanger critical areas such as breeding or spawning grounds, habitat for threatened or endangered species, areas with sensitive biota, shellfish beds, fisheries, drinking water intakes and sources, or recreational areas.

Because pollutant concentrations may exceed numeric criteria within mixing zones, these elevated concentrations could adversely affect the productivity of the waterbody and have unanticipated ecological consequences. Therefore, the EPA recommends that the use of mixing zones in the development of WQBELs in NPDES permits be carefully evaluated and appropriately limited on a case-by-case basis in light of the overarching requirement to protect the designated use of the waterbody as a whole pursuant to [40 CFR 131.10](#).

Due to potential additive or synergistic effects of certain pollutants that could result in the designated use of the waterbody as a whole not being protected, state and tribal mixing zone policies should specify, and permitting authorities should ensure, that mixing zones do not overlap. Additionally, the EPA recommends that permitting authorities evaluate the cumulative effects of multiple mixing zones within the same waterbody. The EPA has developed a holistic approach to determine whether a mixing zone is appropriate based on such cumulative effects considering all of the impacts to the designated uses of the waterbody (see [Allocated Impact Zones for Areas of Non-Compliance \(1995\)](#)). If the total area affected by elevated concentrations within all mixing zones combined is small compared to the total area of the waterbody in which the mixing zones are located, then mixing zones are likely to have little effect on the designated use of the waterbody as a whole, provided that they do not impinge on unique or critical habitats. As understanding of pollutant impacts on ecological systems evolves, states and tribes may find specific cases in which no mixing zone is appropriate.

States and tribes that choose to adopt mixing zone policies should describe the general procedures for defining and implementing mixing zones in terms of location, maximum size, shape, outfall design, and in-zone water quality, at a minimum. Such policies should be sufficiently detailed to support regulatory actions, issuance of permits, and determination of best management practices for nonpoint sources.

The EPA recommends that specific characteristics of an individual mixing zone for a specific discharger be defined on a case-by-case basis using the state or tribal mixing zone policy. This site-specific assessment would ideally take into consideration the physical, chemical, and biological characteristics of the discharge (including the type of pollutant discharged) and receiving waterbody; the life history and behavior of organisms in the receiving waterbody; and the designated uses of the waterbody.

#### Location

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methods for preventing lethality to organisms passing through a mixing zone.

States and authorized tribes should restrict the potential locations of mixing zones as a way to protect stationary benthic organisms and human health from the potential adverse effects of elevated pollutant levels. In addition, states and tribes should prohibit mixing zones where they may endanger biologically important and other critical areas that the state, tribe, or federal government has identified. These include breeding and spawning grounds, habitat for threatened or endangered species, areas with sensitive biota, shellfish beds, fisheries, drinking water intakes and sources, and recreational areas.

Pollutant concentrations above the chronic aquatic life water quality criterion may prevent sensitive taxa from living and reproducing successfully within the mixing zone. In this regard, benthic and territorial organisms may be of greatest concern in protecting aquatic life within a mixing zone. The higher the pollutant concentrations occurring within the mixing zone, the more taxa are likely to be adversely affected, thereby affecting the structure and function of the ecological community and, potentially, the designated use of the waterbody as a whole.

For protection of human health, states and tribes should restrict mixing zones such that they do not result in significant human health risks when evaluated using reasonable assumptions about exposure pathways. For example, where drinking water contaminants are a concern, the mixing zones should not encroach on drinking water intakes and sources. Where fish tissue residues are a concern (either because of measured or predicted residues), mixing zones should not result in significant human health risks to average and sensitive subpopulations of consumers of fish and shellfish after considering exposure duration of the affected aquatic organisms in the mixing zone and the patterns of fisheries use in the area. Where waters are designated for primary contact recreation, mixing zones for bacteria should not result in significant human health risks to people recreating in such waters. In all cases, it is critical that the designated use of the waterbody as a whole is protected.

### Size

In order to protect the designated uses of the waterbody as a whole, pollutant concentrations within any mixing zone should not be lethal to mobile, migrating, and drifting organisms in the waterbody or cause significant human health risks considering likely pathways of exposure. One means of achieving these objectives is to limit the size of the mixing zone.

Most states and authorized tribes allow mixing zones as a matter of policy but also specify general spatial dimensions that limit their size. States and tribes have developed various methods of defining the maximum allowable size of mixing zones for various types of waters. State and tribal policies dealing with streams and rivers often limit mixing zone widths, cross-sectional areas, and/or flow volumes and allow lengths to be determined on a case-by-case basis. For lakes, estuaries, and coastal waters, dimensions are usually specified by surface area, width, cross-sectional area, and/or volume. The EPA recommends that states and tribes use methods that result in quantitative measures sufficient for permitting authorities to develop WQBELs in a transparent and straightforward manner.

If a mixing zone is authorized for a specific discharge, the permitting authority then defines the actual size of an individual, site-specific mixing zone for the specific discharge on a case-by-case basis using the general size restrictions in the state or tribal mixing zone policy. The area or volume of an individual mixing zone or group of mixing zones should be as small as practicable so that it does not interfere with the designated uses or with the established community of aquatic life in the segment for which the uses are designated.

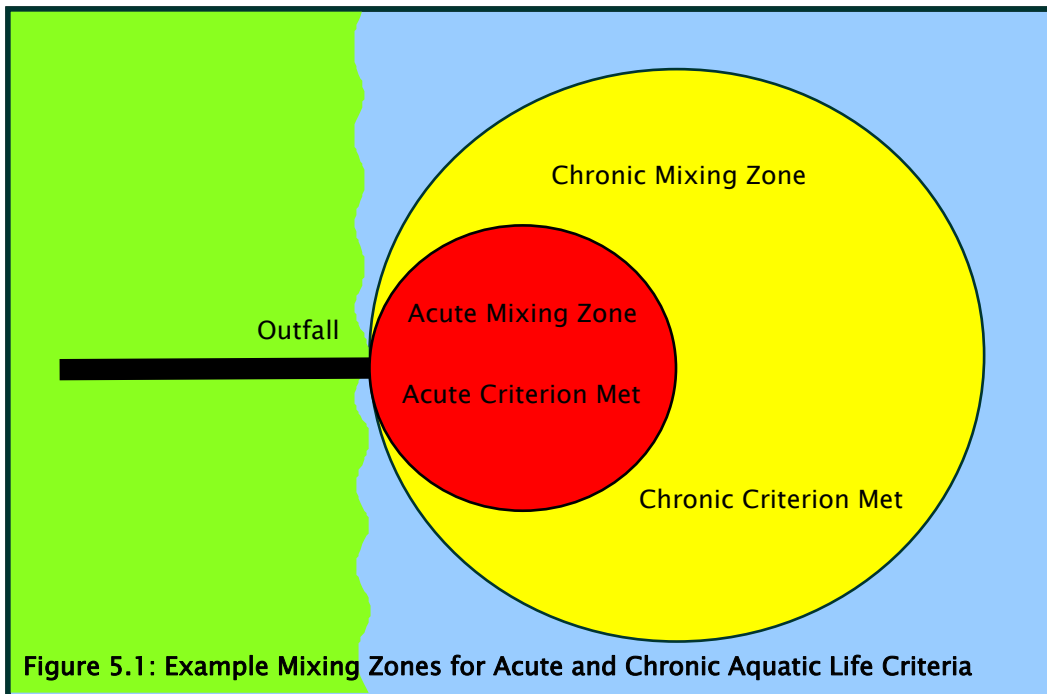
In general, where a state or tribe has both acute and chronic aquatic life water quality criteria as well as human health criteria for the same pollutant, states and tribes may establish independent mixing zone size specifications that apply to each criteria type. For aquatic life criteria, there may be up to two types of mixing zones: one for the acute criterion and one for the chronic criterion (see Figure 5.1).

In the zone immediately surrounding the outfall, both the acute and the chronic criteria may be exceeded, but the acute criterion is met at the edge of this zone, which is often referred to as the acute mixing zone or the zone of initial dilution. The acute mixing zone is sized to prevent lethality to passing organisms in order to protect the designated use of the waterbody as a whole.

In the next mixing zone, which is often called the chronic mixing zone, the chronic criterion may be exceeded, but the acute criterion is met. The chronic criterion is met at the edge of the chronic mixing zone. The chronic mixing zone is sized to protect the designated use of the waterbody as a whole.

Where the state or tribe also has human health criteria for the pollutant of concern, the human health mixing zone is sized to prevent significant human risks in order to protect the designated use of the waterbody as a whole.





For a particular pollutant found in a particular discharge, the magnitude, duration, frequency, and any authorized mixing zone associated with each of the criteria types (i.e., human health and acute and chronic aquatic life) will determine which criterion most limits the allowable discharge. In all cases, the permitting authority should evaluate the size of the site-specific mixing zone to determine its effect on the designated use of the waterbody as a whole. Section 2.2.2 of the [TSD \(1991\)](#) contains information for determining whether a mixing zone's size is appropriate.

State and tribal mixing zone policies should identify zones of passage within waterbodies that contain migrating, free-swimming, or drifting organisms. Zones of passage are continuous water routes of such volume, area, and quality as to allow the passage of free-swimming and drifting organisms without significant adverse effects on their populations. Many species migrate for spawning and other purposes. Not only do migrating species (e.g., anadromous and catadromous species) need to be able to reach suitable spawning areas, their young (and in some cases the adults) require a safe return route to their growing and living areas. Elevated pollutant concentrations within a mixing zone can create barriers that hinder or prevent safe migration. Therefore, mixing zones should be sized and located appropriately within the waterbody to provide a continuous zone of passage that protects migrating, free-swimming, and drifting organisms.

### Shape

The waterbody type, outfall design, and characteristics of the discharge will determine the shape of a mixing zone. The shape should be a simple configuration that is easy to locate in a waterbody and that avoids impingement on biologically important areas. In lakes, a circle with a specified radius is generally preferable, but other shapes may be appropriate in the case of unusual site

requirements.

"Shore-hugging" plumes should be avoided in all waterbodies. Shore areas are often the most biologically productive and sensitive areas of a waterbody, and they are often used for recreation. Shore-hugging plumes generally do not mix as well with receiving waters and, thus, do not dilute as well as mixing zones with other shapes that do not hug shorelines. Because shore-hugging plumes tend to keep unmixed water over the benthic area or in the recreational area, they are more likely to adversely affect the designated uses of the waterbody.

### Outfall Design

Because outfall design affects the amount of initial mixing that occurs, state and tribal mixing zone policies should instruct dischargers to utilize the best practicable engineering design of the outfall to maximize initial mixing. Sometimes, modifying the design of the diffuser, the location of the outfall, or other outfall design characteristics can reduce significant adverse impacts to the waterbody because different design characteristics have different effects on mixing. Many different factors affect how well the outfall design allows the discharge to mix with the receiving water including the following:

- The height of the outfall with respect to the surface and bottom of the waterbody.
- The distance of the end of the pipe to the nearest bank (i.e., whether the outfall is in the middle of the waterbody or close to one side).
- The angle of the discharge.
- The type of diffuser that is used (i.e., single-port or multi-port diffuser).

Section 4.4.1 of the [TSD \(1991\)](#) describes recommendations for outfall design in more detail.

### In-zone Water Quality

States and authorized tribes should ensure that a minimum level of water quality is maintained within a mixing zone. Mixing zones should attain the "free from" narrative water quality criteria that are applicable to all waters in a state or reservation. For example, the EPA recommends that mixing zones be free from the following:

- Materials in concentrations that will cause acutely toxic conditions to aquatic life.<sup>3</sup>
- Materials in concentrations that settle to form objectionable deposits.
- Floating debris, oil, scum, and other material in concentrations that form nuisances.
- Substances in concentrations that produce objectionable color, odor, taste, or turbidity.

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<sup>3</sup> Acutely toxic conditions are those that are lethal to aquatic organisms that may pass through the mixing zone. The underlying assumption for allowing a mixing zone is that pollutant concentrations in excess of acute and chronic criteria, but below acutely toxic concentrations, may exist in small areas without causing adverse effects to the designated use of the waterbody as a whole.

- Substances in concentrations that produce undesirable aquatic life or result in a dominance of nuisance species.

### 5.1.2 Situations in Which Mixing Zones May Not Be Appropriate

As discussed above, states and authorized tribes are not required to allow mixing zones. Even if a state or tribe chooses to allow mixing zones generally, it may also choose to define in its policy circumstances under which mixing zones are prohibited (e.g., for particular pollutants and/or waterbodies). Likewise, where the state or tribe generally allows mixing zones, the permitting authority may decide that a mixing zone is not appropriate for a particular discharge on a site-specific basis.<sup>4</sup> States and tribes should conclude that mixing zones are not appropriate in the following situations:

- Where they may impair the designated use of the waterbody as a whole.
- Where they contain pollutant concentrations that may be lethal to passing organisms.
- Where they contain pollutant concentrations that may cause significant human health risks considering likely pathways of exposure.
- Where they may endanger critical areas such as breeding and spawning grounds, habitat for threatened or endangered species, areas with sensitive biota, shellfish beds, fisheries, drinking water intakes and sources, and recreational areas.

Additionally, states and tribes should carefully consider whether mixing zones are appropriate where a discharge contains bioaccumulative, pathogenic, persistent, carcinogenic, mutagenic, or teratogenic pollutants or where a discharge containing toxic pollutants may attract aquatic life.

Bioaccumulative pollutants are one example of a pollutant for which mixing zones may not be appropriate because they may cause significant human health risks such that the designated use of the waterbody as a whole may not be protected.<sup>5</sup> Therefore, the EPA recommends that state and tribal mixing zone policies do not allow mixing zones for discharges of bioaccumulative pollutants. The EPA adopted this approach in 2000 when it amended its 1995 *Final Water Quality Guidance for the Great Lakes System* at [40 CFR Part 132](#) to phase out mixing zones for existing discharges of bioaccumulative pollutants within the Great Lakes Basin and ban such mixing zones for new discharges within the Basin.

Because fish tissue contamination tends to be a far-field problem affecting entire or downstream waterbodies rather than a near-field problem being confined to the area within a mixing zone, a state or tribe may find it appropriate to restrict or eliminate mixing zones for bioaccumulative

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<sup>4</sup> The 1996 memorandum [EPA Guidance on Application of State Mixing Zone Policies in EPA-issued NPDES Permits](#) describes the circumstances under which the EPA may include a mixing zone in an NPDES permit when the EPA is the permitting authority.

<sup>5</sup> However, note that some chemicals of relatively low toxicity such as zinc will bioconcentrate in fish without harmful effects resulting from human consumption.

pollutants in certain situations such as the following:

- Where mixing zones may encroach on areas often used for fish harvesting, particularly for stationary species such as shellfish.
- Where there are uncertainties in the protectiveness of the water quality criteria or the assimilative capacity of the waterbody.

[Chapter 3](#) of this Handbook and Chapter 5 of [Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health \(2000\)](#) provide additional information about bioaccumulation, and Section 4.3.4 of the [TSD \(1991\)](#) discusses preventing bioaccumulation problems for human health in calculating WQBELs.

Another example of a pollutant for which a mixing zone may not be appropriate is bacteria. Because bacteria mixing zones may cause significant human health risks and endanger critical areas (e.g., recreational areas), the EPA recommends that state and tribal mixing zone policies do not allow mixing zones for bacteria in waters designated for primary contact recreation. The presumption in a river or stream segment designated for primary contact recreation is that primary contact recreation can safely occur throughout the segment and, therefore, that bacteria levels will not exceed criteria throughout the segment. Epidemiological studies have demonstrated that illness rates are higher when the criteria are exceeded compared to when those criteria are not exceeded (see Sections 3.2 and 3.3 of the EPA's [Recreational Water Quality Criteria \(2012\)](#)). Therefore, people recreating in or through a bacteria mixing zone (where bacteria levels may be elevated above the criteria levels) may be exposed to greater risk of gastrointestinal illness than would otherwise be allowed by the state or tribal criteria for protection of the recreation use. Given this presumption, states and tribes should carefully evaluate whether authorizing a mixing zone that results in elevated levels of bacteria in a river or stream designated for primary contact recreation will adversely affect the designated use. If so, then states and tribes should not authorize such mixing zones because they could result in a significant human health risk.

A third example of a situation in which the EPA recommends that states and tribes prohibit a mixing zone is when an effluent is known to attract biota. In such cases, a continuous zone of passage around the mixing area will not protect aquatic life. Although most toxic pollutants elicit a neutral or avoidance response, there are some situations in which aquatic life are attracted to a toxic discharge and, therefore, can potentially incur significant exposure. For example, temperature can be an attractive force and may counter an avoidance response to a particular pollutant. Therefore, the organisms would tend to stay in the mixing zone rather than passing through or around it. Innate behavior such as migration may also counter an avoidance response and cause fish to incur significant exposure.

### **5.1.3 Mixing Zones for the Discharge of Dredged or Fill Material**

In conjunction with the Department of the Army, the EPA has developed guidelines at [40 CFR Part 230](#) for evaluating discharges of dredged or fill material into navigable waters, which include

provisions at 40 CFR 230.11(f) for determining the acceptability of mixing zones for such material. Discharges of dredged or fill material are generally temporary and result in short-term disruption to the waterbody rather than constituting a continuous discharge with long-term disruption beyond the fill area. In authorizing and establishing mixing zones for dredge and fill activities, the state or authorized tribe's primary consideration should be achieving and protecting the designated uses of the waterbody pursuant to [40 CFR 131.10](#). As such, states and tribes should evaluate the particular pollutants involved for their effects on the designated use. Technical guidance for determining the potential for contaminant-related impacts associated with the discharge of dredged material can be found in [Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual: Inland Testing Manual \(1998\)](#).

#### **5.1.4 Mixing Zones for Aquaculture Projects**

Under Section 318 of the [CWA](#), permitting authorities may allow discharges of certain pollutants associated with approved aquaculture projects. Consistent with [40 CFR 122.25](#), an aquaculture project is a defined, managed water area into which certain pollutants are discharged for the maintenance or production of harvestable freshwater, estuarine, or marine plants or animals. The EPA's regulations at [40 CFR 125.11](#) provide that aquaculture project approval must not result in the enlargement of a pre-existing mixing zone beyond the area designated for the original discharge and that the designated project area (which is also defined at 40 CFR 122.25) must not include a portion of a waterbody large enough to expose a substantial portion of the indigenous biota to the conditions within the designated project area. For example, a designated project area should not include the entire width of a stream because all of the indigenous organisms might be exposed to pollutant discharges that would exceed WQS. The areas designated for approved aquaculture projects should be treated in the same manner as other mixing zones.

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## **5.2 Critical Low Flows for Water Quality Criteria Implementation**

Pursuant to [40 CFR 131.11\(a\)](#), states and authorized tribes must adopt those water quality criteria that protect designated uses. To ensure that adopted criteria are protective of the designated uses, states and tribes generally establish critical low-flow values to support implementation of the applicable criteria through such programs as NPDES permitting.

Critical low-flow conditions present special challenges to the integrity of the aquatic community and the protection of human health. Dilution is one of the primary mechanisms by which the concentrations of contaminants in effluent discharges are reduced following their introduction into a receiving water. Low flows in the receiving water typically aggravate the effects of effluent discharges because, during a low-flow event, there is less water available for dilution, resulting in higher instream concentrations of pollutants. Therefore, the allowable dilution (which may be only a portion of the critical low flow depending on the state or tribal WQS and implementation

procedures) for purposes of determining the need for and establishing WQBELs in NPDES permits should ensure protection of the applicable criteria at the calculated critical low-flow value.

The EPA has historically encouraged states and tribes to specify directly within their WQS which calculated critical low-flow values should be used to determine the available dilution for the purposes of determining the need for and establishing WQBELs. Such critical low-flow values have historically been reviewed and approved or disapproved by the EPA as new or revised WQS under Section 303(c) of the [CWA](#). Likewise, revisions to those critical low-flow values would generally constitute new or revised WQS subject to EPA review and approval or disapproval (see [Chapter 1](#) of this Handbook and [What is a New or Revised Water Quality Standard Under CWA Section 303\(c\)? Frequently Asked Questions \(2012\)](#)).

Most states and tribes generally follow the guidance in the [TSD \(1991\)](#) when adopting critical low-flow values for criteria implementation. The EPA recommends that states and tribes adopt the critical low-flow values for use in steady-state analyses so that criteria are implemented appropriately. If criteria are implemented using inappropriate critical low-flow values (i.e., calculated values that are too high), the resulting control of toxic pollutants may not be fully protective because the resulting ambient concentrations could exceed criteria when such low flows occur. In the case of aquatic life, more frequent excursions than are allowable (e.g., more than once in three years) could result in unacceptable effects on aquatic organisms and designated uses if the appropriate value is not used in the calculations.

In addition to steady-state models, the TSD recommends the use of three dynamic models to perform wasteload allocations. Because dynamic wasteload models do not generally use specific steady-state critical low-flow values but accomplish the same effect by factoring in the probability of occurrence of stream flows based on the historical flow record, this Handbook discusses only steady-state conditions.

In Appendix D of the TSD and [Technical Guidance Manual for Performing Wasteload Allocations, Book VI: Design Conditions – Chapter 1: Stream Design Flow for Steady-State Modeling \(1986\)](#), the EPA describes and recommends two methods for calculating acceptable critical low-flow values: the traditional hydrologically based method developed by the United States Geological Survey (USGS) and a biologically based method developed by the EPA.<sup>6</sup> The hydrologically based critical low-flow value is determined statistically using probability and extreme values, while the biologically based critical low flow is determined empirically using the specific duration and frequency associated with the criterion.

Additionally, the two documents listed above describe the flow values that the EPA recommends for implementing acute and chronic criteria using both methods. Table 5.1 below summarizes these recommendations.

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<sup>6</sup> In some EPA documents such as those cited, critical low flow is also called “design flow” or “stream design flow.” These terms are different from a facility or effluent design flow.

**Table 5.1: EPA–recommended Critical Low Flows for Aquatic Life and Human Health Criteria**

Criteria	Hydrologically Based Flow	Biologically Based Flow
Acute Aquatic Life	1Q10	1B3
Chronic Aquatic Life	7Q10	4B3
Human Health	Harmonic mean	

Using the hydrologically based method, 1Q10 represents the lowest one–day average flow event expected to occur once every ten years, on average, and 7Q10 represents the lowest seven–consecutive–day average flow event expected to occur once every ten years, on average. Using the biologically based method, 1B3 represents the lowest one–day average flow event expected to occur once every three years, on average, and 4B3 represents the lowest four–consecutive–day average flow event expected to occur once every three years, on average.

States and tribes may designate other critical low–flow values to implement the applicable criteria, provided they are scientifically justified. The EPA has also recommended critical low–flow values that differ from the above recommendations for specific pollutants such as 30Q5, 30Q10, and 30B3 for implementing chronic criteria for ammonia.

The EPA does not view the fact that many streams within a state or tribe have no flow at 7Q10 as adequate justification for designating alternative flows. Note that, when a criterion specifies a four–day average concentration that should not be exceeded more than once every three years, this condition should not be interpreted as implying that a 4Q3 low flow is appropriate for use as the hydrologically based critical low–flow value for assessing impacts on the receiving water.

The EPA recommends the harmonic mean flow for implementing human health criteria. The concept of a harmonic mean is a standard statistical data analysis technique. The EPA's model for human health effects assumes that such effects occur because of a long–term exposure to low concentrations of a toxic pollutant (e.g., two liters of water per day for seventy years). The harmonic mean flow allows for estimating the concentration of toxic pollutant contained in those two liters of water per day when the daily variation in the flow rate is high. Therefore, the EPA recommends use of the harmonic mean flow in computing critical low flows for human health criteria rather than using other averaging techniques.

In addition to the documents listed above, see the EPA's [Flow 101 webpage](#) and [Advanced Notice of Proposed Rulemaking for Water Quality Standards \(1998\)](#) for additional information on critical low flows.

The EPA notes that the USGS has documented that, in some areas of the United States, there have been changes to the critical low flows in freshwater rivers and streams or increased duration and frequency of low flow occurrence. The source of the reductions may often be anthropogenic in origin such as over–pumping of groundwater, hydrologic alteration including impoundments, or surface water withdrawals. Some of these reductions may persist long enough to cause changes to the critical low–flow values. In addition, prolonged droughts have resulted in a reduction of the low–flow minimums released on regulated rivers or revisions to drought control manuals to allow

for further reductions of the low-flow values. During prolonged droughts, there may also be a trend towards increased pumping of groundwater, which may, in turn, lead to a reduction of surface water flows. New water intakes may also permanently change a waterbody's critical low flow. The following documents provide additional information on changing flow patterns:

- The USGS's [National Water Census – Streamflow webpage](#).
- The USGS's [Groundwater Depletion in the United States \(1900–2008\) \(2013\)](#).
- The USGS's [Alteration of Streamflow Magnitudes and Potential Ecological Consequences: a Multiregional Assessment \(2011\)](#).
- The EPA's [Report on the Environment – Fresh Surface Water webpage](#).

It may be prudent for states and tribes to review and revise, as appropriate, their critical low-flow values during the triennial review process to account for changes to historical flow patterns. Also, NPDES permitting authorities should be aware that these altered historical flow patterns in rivers and streams may render historical flow records less accurate in predicting current and future critical flows. Where appropriate, permitting authorities should consider alternate approaches to establishing critical low-flow conditions that account for these climatic and anthropogenic changes when conducting reasonable potential analyses and in establishing protective WQBELs (see [NPDES Permit Writers' Manual: Inclusion of Climate Change Considerations](#)).



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## 5.3 Variances from Water Quality Standards

A WQS variance is a time-limited designated use and water quality criterion for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable condition during the term of the WQS variance. A WQS variance may apply to an NPDES-permitted discharger or waterbody/waterbody segment(s). The regulation at [40 CFR 131.13](#) provides that states and authorized tribes may adopt into their WQS general variance policies that describe how they intend to apply and implement variances. Although such variance policies require EPA review and approval, states and tribes are not required to adopt variance policies in order to adopt individual variances. Nevertheless, as opposed to individual mixing zones (discussed in Section 5.1 of this chapter), the individual variances themselves must be adopted into WQS (or other legally binding state or tribal requirements) and approved by the EPA before they can be effective for [CWA](#) purposes.

Although the legal authority to adopt a WQS variance is the same as a revision to a designated use, the purpose of a variance is different from that of a designated use revision (described in [Chapter 2](#) of this Handbook). A variance is intended to serve as a mechanism to provide time for states, tribes, and stakeholders to implement actions to improve water quality over an identified period of time when and where the designated use currently in place is not being met. When utilizing a variance, the state or tribe retains the designated use that is currently in place as a long-term goal. As first articulated in 1977 in [Decision of the General Counsel on Matters of Law Pursuant to 40 CFR Section 125.36\(m\). No. 58](#), a state or tribe may adopt a WQS variance if the state or tribe can satisfy the same substantive and procedural requirements as a designated use removal, which are described in 40 CFR 131.10(g).

A variance is also different from a permit compliance schedule. While both tools can provide time to meet regulatory requirements, which tool is appropriate depends upon the circumstances. Variances can be appropriate to address situations where it is known that the designated use and criterion are unattainable today (or for a limited period of time), but feasible progress could be made toward attaining the designated use and criterion. A permit compliance schedule, on the other hand, may be appropriate when the designated use is attainable, but the discharger needs additional time to modify or upgrade treatment facilities in order to meet its WQBEL such that a schedule and resulting milestones will lead to compliance “as soon as possible” with the WQBEL based on the currently applicable WQS. See CWA Section 502(17) for a definition of “schedules of compliance” and [40 CFR 122.47](#).

A variance may be appropriate where a state or tribe determines that the designated use cannot be attained for a period of time because the discharger cannot immediately meet a WQBEL, which is written to meet a particular WQS, or a waterbody/waterbody segment cannot immediately meet the criteria to protect the designated use. Under such circumstances, the variance provides a targeted, time-limited revision to the WQS that reflects the highest attainable condition. These new time-limited WQS then serve as the basis for pollution control requirements during the term of the

variance. For WQS variances that apply to aquatic life, wildlife, and recreational uses (i.e., the Section 101(a)(2) uses), this means that attainment of the designated use is infeasible under at least one of the six factors at 131.10(g) for at least the term of the variance.

The practical effect of the variance is an NPDES permit containing a WQBEL that complies with a less stringent criterion than would otherwise be in effect in the absence of the variance. However, the underlying designated use and criteria remain in effect for Section 303(d) listing and total maximum daily load development regardless of whether the variance is for a single discharger, multiple dischargers, or a waterbody/waterbody segment. At the end of the variance term, the discharger's WQBEL must ensure compliance with the underlying designated use and criterion or the state or tribe must obtain a new variance. To obtain a new variance, the state or tribe must again demonstrate that the designated use is not attainable at the point of discharge and again submit the variance to the EPA for review and approval or disapproval.

In many cases, a WQS variance is an environmentally useful tool because a variance exists only for a defined term and retains designated use protection for all pollutants and sources, with the sole exception of those specified in the variance. Even the discharger with a variance for a particular pollutant is required to meet applicable criteria for all other pollutants. Thus, a variance can result in water quality improvements over time and, in some cases, full attainment of designated uses by maintaining existing water quality protections while allowing time for advances in treatment technologies, control practices, or other changes in circumstances.

States and tribes typically adopt a WQS variance for an individual discharger for a specific pollutant in a specific waterbody. However, where multiple dischargers have similar attainment challenges, a state or tribe may streamline its variance process by adopting a multiple-discharger WQS variance. Such a variance applies to several dischargers but may be supported by a single technical rationale justifying the need for the variance. The EPA has previously published information on both individual- and multiple-discharger variances at [40 CFR Part 132](#). For additional information on variances, also see [\*Discharger-Specific Variances on a Broader Scale: Developing Credible Rationales for Variances that Apply to Multiple Dischargers\* \(2013\)](#).

# **Water Quality Standards Handbook**

## **Chapter 6: Procedures for Review and Revision of Water Quality Standards**

# Water Quality Standards Handbook

## Chapter 6: Procedures for Review and Revision of Water Quality Standards

[\(40 CFR Part 131 – Subpart C\)](#)

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## Introduction

The [Clean Water Act \(CWA\)](#) requires states and authorized tribes to periodically review and, as appropriate, adopt new or revised water quality standards (WQS) to meet the requirements of the CWA.<sup>1</sup> States and tribes must submit any new or revised WQS resulting from such a review to the EPA for review and approval or disapproval action under CWA Section 303(c). This chapter provides an overview of these state, tribal, and federal processes. In particular, Section 6.1 of this chapter discusses state and tribal processes for review and revision of WQS and provides information on the regulatory requirements to which states and tribes must adhere during their WQS review, adoption, and submittal processes. Section 6.2 discusses the EPA review and approval or disapproval procedures of new or revised WQS. Section 6.3 discusses procedures for EPA promulgation of federal WQS and circumstances under which the EPA would withdraw federally promulgated WQS.

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## 6.1 State and Tribal Processes for Review and Revision of Water Quality Standards

Section 303(c)(1) of the [CWA](#) and the EPA's implementing regulations at [40 CFR 131.20](#) require that states and authorized tribes, from time to time, but at least once every three years, hold public hearings to review applicable WQS and, as appropriate, modify and adopt WQS. In each WQS review cycle, states and tribes, with input from the public, review their existing WQS to identify additions and/or revisions that are necessary or appropriate to ensure that their WQS meet the requirements of the CWA and the needs of the state or tribe. States and tribes may revise their WQS in a variety of ways including additions of and revisions to designated uses, water quality criteria, antidegradation policies and adopted implementation procedures, or other general policies. The following are examples of items that states and tribes should consider when reviewing their WQS:

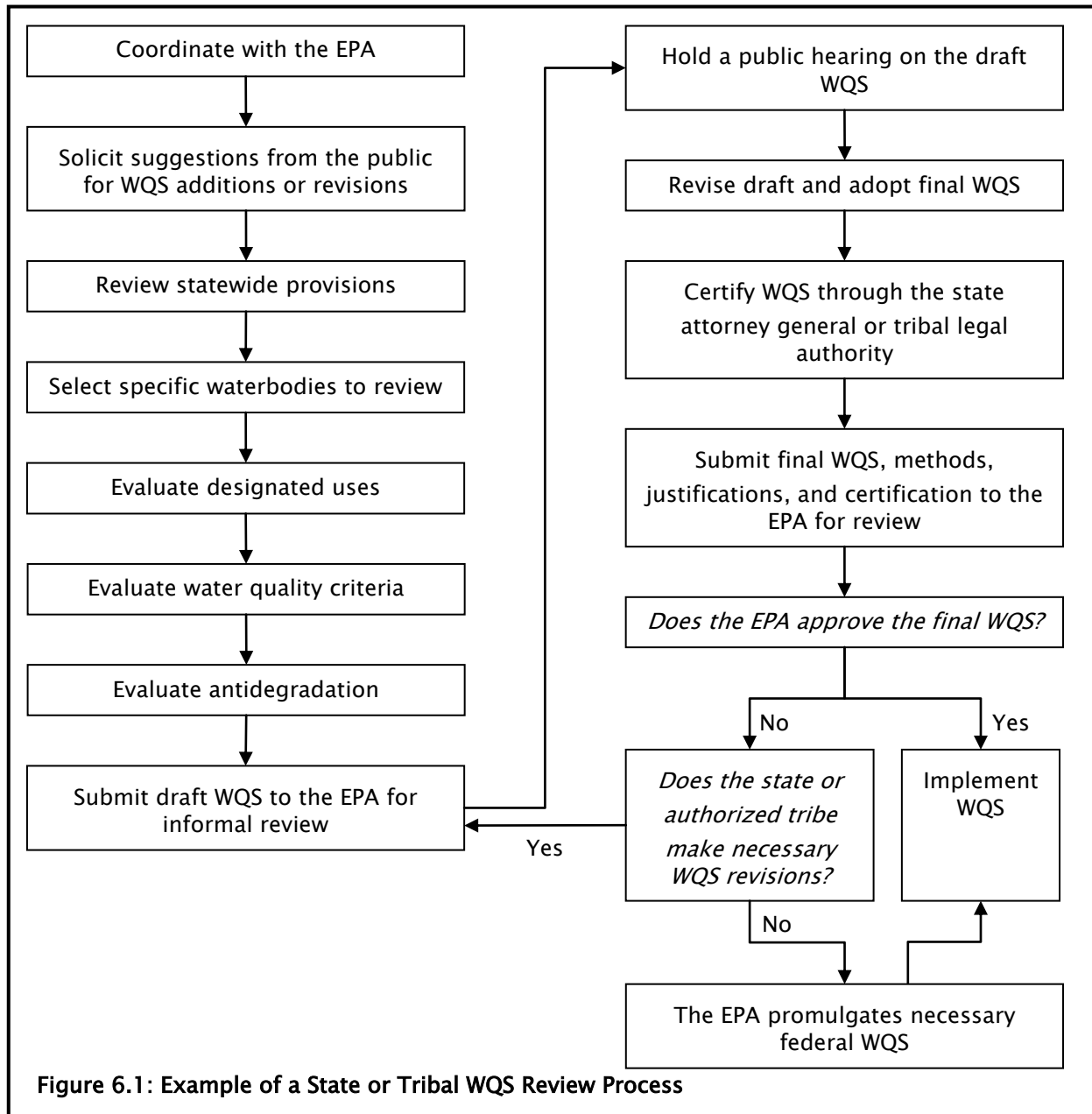
- New federal, state, or tribal statutes, regulations, or guidance.
- Legal decisions involving WQS.
- New or updated scientific information (e.g., new or updated Section 304(a) national criteria recommendations).
- Input from members of the public.
- Section 305(b) reports and newly available water quality monitoring data.
- Results of previous WQS triennial reviews.
- Changes in circumstances that affect the attainability of applicable WQS.
- Other necessary or appropriate clarifications or revisions.

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<sup>1</sup> Throughout this document, the term “states” means the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the 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.

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Figure 6.1 displays an example of a state or tribal WQS review process.



### 6.1.1 Coordinate with the EPA

The EPA recommends that states and authorized tribes coordinate with the EPA when they begin the triennial review process as well as before beginning activities to adopt new or revised WQS, long before the state or tribe formally submits the WQS for EPA review. Reasons for early coordination with the EPA include the following:

- Early identification of potential areas of scientific or programmatic concern that require resolution between the EPA and the state or tribe.
- Discussion and resolution of any such concerns before the EPA receives a formal review request from the state or tribe.
- Increased likelihood that state or tribal WQS meet the requirements of the [CWA](#) and [40 CFR Part 131](#) at the time of submission to the EPA.

While not a regulatory requirement, states and tribes may send draft WQS to the EPA for early feedback. The EPA will then provide comments on the proposed revisions to assist the state or tribe in developing WQS that are approvable by the EPA. Coordination between the state or tribe and the EPA throughout the review process is key to the EPA's timely review of state and tribal WQS.

### **6.1.2 Involve the Public**

An important component of both the WQS triennial review process and any WQS revisions that result from such a process is meaningful involvement of the public and intergovernmental coordination with local, state, federal, and tribal entities with an interest in water quality issues. The EPA urges states and authorized tribes to involve the public actively in the WQS review process by soliciting suggestions for additions and revisions to WQS. At a minimum, Section 303(c) of the [CWA](#) and [40 CFR 131.20](#) require states and tribes to hold a public hearing in reviewing and revising WQS and to submit the results to the EPA. The regulation at [40 CFR Part 25](#) also describes additional requirements for public involvement. State and tribal regulations may require more than one hearing. The EPA also encourages states and tribes to solicit input from the public through other means such as webinars and web postings using social media.

Engaging citizens, municipalities, industries, environmentalists, universities, other tribes, other states, and other entities in collecting and evaluating information for the decision-making process may assist the state or tribe in improving the scientific basis of and building support for WQS decisions. These partnerships ensure that ideas, data, and information are shared, which will increase the effectiveness of the water quality management process. Open discussion of the scientific evidence and analysis supporting proposed revisions to the WQS can assist the state or tribe in making its WQS decisions.

### **6.1.3 Review Provisions that are Applicable across the State or Reservation**

Part of the state or tribal WQS review process includes reviewing the general policies and other provisions that are applicable across the state or reservation to determine if additions or revisions are necessary. Such policies and provisions may include, but are not limited to, the following:

- WQS coverage for all waters of the United States.
- Appropriate use designations including downstream protection provisions.
- Water quality criteria review and development.
- Antidegradation policies and implementation procedures.
- Mixing zone policies.

- Compliance schedule authorizing provisions.
- Low-flow provisions.
- Variance provisions.
- Definitions.

Under the [CWA](#), states and authorized tribes must adopt WQS for all of their intrastate and interstate navigable waters, i.e., for all "waters of the United States," within their jurisdiction. The term "waters of the United States" is defined at [40 CFR 230.3\(s\)](#) and [33 CFR Part 328](#), and other terms relevant to WQS are defined at [40 CFR 131.3](#). State and tribal WQS should contain these or equivalent definitions that are at least as inclusive of waters as the federal definitions.

#### **6.1.4 Select Specific Waterbodies to Review**

Consistent with [40 CFR 131.20\(a\)](#), states and authorized tribes should use any procedures they have incorporated into their Continuing Planning Process for identifying and reviewing WQS on specific waterbodies (see also [40 CFR 130.5](#)). Every three years, states and tribes must reexamine any waterbodies for which the WQS do not include the goal uses specified in Section 101(a)(2) of the [CWA](#) and, if new information indicates that such uses are attainable, revise their WQS to reflect such uses. In addition to such waterbodies, the EPA recommends that states and tribes consider conducting a detailed WQS review for waterbodies where one or more of the following occur:

- The state or tribe has identified toxic or other pollutants, such as nutrients, that may be precluding attainment of a designated use or posing an unreasonable risk to human health.
- Pollutants could have potential adverse impacts on threatened or endangered species.
- National Pollutant Discharge Elimination System permits containing water quality-based effluent limits are scheduled to be issued or reissued.
- Funding decisions for combined sewer overflows are pending.
- The public has expressed interested in having the state review the WQS that are applicable to a particular waterbody.

States and tribes may find it useful to identify such waters by examining reports and listings developed under Sections 303(d), 304(l), 305(b), and 319 as well as unclassified waters, construction grants priority lists, and expired major permits. States and tribes may have other reasons for deciding to examine a waterbody in detail such as human health problems, court orders, public input, or the economic and social impacts of implementing the existing WQS.

#### **6.1.5 Evaluate Designated Uses**

Once the state or authorized tribe has selected priority waterbodies for review, the state or tribe must evaluate the designated uses. An integral part of the WQS review and revision process is considering whether a selected waterbody is able to attain its designated use and, if such waters had not included the uses specified in [CWA](#) Section 101(a)(2), whether such uses are now attainable, as required by [40 CFR 131.20\(a\)](#). This consideration may involve some level of data collection up to and including a full waterbody survey and assessment; however, an intensive survey of the waterbody is



not necessary if adequate data are already available. The data and information collected from the waterbody survey should provide a firm basis for evaluating whether the waterbody can attain its designated use or a designated use closer to the uses specified in Section 101(a)(2) in light of the factors precluding attainment described at 40 CFR 131.10(g). The purpose of the evaluation is to characterize present uses, attainable/unattainable designated uses, and the reasons why uses are unattainable. Information generated in the survey also can be used to establish the basis for seasonal uses and subcategories of uses.

Where designated uses that include the uses specified in Section 101(a)(2) are not feasible to attain, states and tribes should determine the designated use that is feasible to attain in light of the factors precluding attainment and any other data that were used to evaluate attainability. To that end, the state or tribe may conduct a use attainability analysis (UAA) to demonstrate that attaining the use is not feasible based on one of the factors at 40 CFR 131.10(g) and then designate the use(s) that can be attained given the physical, chemical, and biological limitations of the waterbody.

In designating uses and the water quality criteria necessary to protect the uses, it is important to emphasize that each state and tribe must “ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters,” as required by 40 CFR 131.10(b). The EPA recommends that states and tribes consider the interaction between both point- and nonpoint- source discharges and downstream impacts as well as the fact that the downstream uses may not be affected by the same physical or other limitations as the upstream uses. For additional information on protecting downstream waters, see [Protection of Downstream Waters in Water Quality Standards: Frequently Asked Questions \(2014\)](#).

Please refer to [Chapter 2](#) of this Handbook for a detailed discussion of designated uses.

### **6.1.6 Evaluate Water Quality Criteria**

The regulation at [40 CFR 131.11](#) provides that states and authorized tribes “must adopt those water quality criteria that protect the designated use.” If a state or tribe revises a designated use or adopts a new designated use, the state or tribe must ensure that it has adopted criteria to protect the new or revised designated use. If the state or tribe removes a designated use, the state or tribe may delete the criteria to protect the designated use as long as there are still criteria to protect the remaining uses.

The regulation at 40 CFR 131.11 and Section 303(c)(2)(B) of the [CWA](#) further require states and tribes to adopt numeric criteria (or narrative criteria with numeric translators) for Section 307(a) toxic pollutants, as necessary, to support state and tribal designated uses where the discharge or presence of such pollutants in the affected waters could reasonably be expected to interfere with those designated uses adopted by the state or tribe. (See [Guidance for State Implementation of Water Quality Standards for CWA Section 303\(c\)\(2\)\(B\) \(1988\)](#).) For regulatory purposes, the EPA has translated the 65 compounds and families of compounds listed under Section 307(a) into 126 specific toxic substances, which the EPA refers to as “priority pollutants,” and has published national criteria recommendations for most of these pollutants consistent with the authority provided in

Section 304(a). Section 304(a)(1) requires the EPA to develop recommended criteria that accurately reflect the latest scientific knowledge, and these recommended criteria are based solely on data and scientific judgments on pollutant concentrations and environmental or human health effects.

In addition to the required criteria discussed above, the EPA recommends that all state and tribal WQS contain narrative "free from" criteria as well as numeric criteria for other water quality parameters such as temperature, dissolved oxygen, pH, and bacteria, which are typically included in state and tribal WQS. The EPA has also recognized the importance of having numeric criteria for both phosphorus and nitrogen and has urged states and tribes to prioritize waters for development of numeric nutrient criteria (see the 2011 memorandum [\*Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions\*](#)).

As previously discussed, Section 303(c)(1) and the EPA's implementing regulation at 40 CFR 131.20(a) require states and tribes to hold a public hearing for the purpose of reviewing their applicable WQS at least once each three-year period. When reviewing these applicable WQS, in addition to reviewing all applicable criteria, states and tribes must ensure that they have adopted criteria for toxic pollutants as required by Section 303(c)(2)(B). It is important to note that, although a state or tribe may have fully complied with the requirements of Section 303(c)(2)(B) previously, states and tribes may be required to adopt new toxic criteria in the following situations:

- The EPA publishes new Section 304(a) national criteria recommendations for a priority pollutant.
- New information on existing water quality and pollution sources indicates that a toxic pollutant for which a state or tribe had not previously adopted criteria could now be reasonably expected to interfere with the designated uses adopted by the state or tribe.

Please refer to [Chapter 3](#) of this Handbook to find a detailed discussion of criteria.

### **6.1.7 Evaluate Antidegradation**

The EPA's regulations at [40 CFR 131.12](#) require states and authorized tribes to include antidegradation requirements and methods for implementing those requirements as part of their WQS program. Because they are parts of WQS, antidegradation policies and adopted implementation procedures are subject to review and revision as part of the WQS triennial review. Each state and tribe must develop, adopt, and retain an antidegradation policy that applies across the state or reservation and establish procedures for its implementation through the water quality management process. The state or tribal antidegradation policy and implementation procedures must be consistent with the components detailed in 40 CFR 131.12. State or tribal WQS regulations must specifically reference the policy if it is not included in its entirety so that the functional relationship between the policy and the other WQS is clear. Regardless of the location of the policy, it must be legally binding and meet all applicable requirements described in 40 CFR 131.12. Antidegradation implementation procedures should specify how the state or tribe would determine on a case-by-case basis whether, and to what extent, the permitting authority might authorize a lowering of high

water quality. As a result, antidegradation implementation is an integral component of a comprehensive approach to enhancing and protecting high water quality.

Please refer to [Chapter 4](#) of this Handbook to find a more detailed discussion of antidegradation.

### **6.1.8 Submit the Water Quality Standards to the EPA**

Consistent with [40 CFR 131.20\(c\)](#), states and authorized tribes must submit their new or revised WQS to the EPA for review and approval or disapproval within 30 days of their final administrative action. Final administrative action is the last action a state or tribe must take (e.g., signature, a review by a legislative committee or state board, a delay mandated by a state administrative procedures act) before its revision becomes a rule under state or tribal law. After such action, the state or tribe can officially transmit the newly adopted WQS to the EPA for review. If no revisions are made, states and tribes must submit the results of their review within 30 days of completion of the review. The state or tribal WQS submission of new or revised WQS must include, at a minimum, the six key elements described in 40 CFR 131.6:

- Waterbody use designations that are consistent with [CWA](#) Sections 101(a)(2) and 303(c)(2).
- Methods and analyses used to support the WQS.
- Water quality criteria sufficient to protect designated uses.
- An antidegradation policy and accompanying implementation procedures consistent with 40 CFR 131.12.
- Certification by the state attorney general or appropriate tribal legal authority that the WQS were duly adopted according to state or tribal law.
- General information that will help the EPA determine whether the scientific basis is adequate for WQS that do not include the uses specified in Section 101(a)(2), including UAs as appropriate, as well as information on state or tribal policies that generally affect the application and implementation of the WQS (e.g., mixing zone and variance policies).

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## **6.2 EPA Review and Approval or Disapproval of New or Revised Water Quality Standards**

When states and authorized tribes adopt new or revised WQS, they are required under [CWA](#) Section 303(c) to submit such WQS to the EPA for review and approval or disapproval action. The EPA [regional offices](#) review state and tribal WQS submissions and serve as the primary point of contact with the states and tribes. EPA regional administrators are responsible for approving or disapproving WQS. Therefore, states and tribes should submit their new or revised WQS to the appropriate EPA regional office.

Please refer to [Chapter 1](#) of this Handbook for a discussion of the types of provisions that constitute new or revised WQS that require EPA review under Section 303(c).

Under Section 303(c)(3) and [40 CFR 131.21](#), the EPA must approve within 60 days or disapprove within 90 days any new or revised WQS adopted by a state or tribe. The EPA reviews the state or tribal WQS following the requirements of Section 303(c) and 40 CFR Part 131 to ensure that the use designations, water quality criteria, antidegradation policy and adopted implementation procedures, and general policies (e.g., WQS variances and mixing zone policies) meet the minimum requirements.<sup>2</sup> In doing so, the EPA ensures that WQS are scientifically defensible and that they adhere to all regulatory and statutory requirements. In reviewing new or revised WQS, the EPA will consider the adequacy of the analyses and the public comments received during the public hearing process. As discussed in Section 6.1.1 of this chapter, states and tribes are encouraged to provide early drafts to the EPA so that any issues can be resolved prior to the state or tribe formally proposing or adopting new or revised WQS.

The EPA only reviews state and tribal WQS provisions that are new or revised. The EPA's review of such WQS generally includes, but is not limited to, those elements listed below that are applicable to the specific new or revised WQS. It is important to note that, because each state or tribal WQS submission is unique, the EPA documents the basis for its actions including how the new or revised WQS are consistent with the CWA and 40 CFR Part 131:

#### Uses and Criteria:

- The EPA determines whether states and tribes have adopted designated uses that include the uses specified in CWA Section 101(a)(2) for all waters of the United States. For waters where Section 101(a)(2) uses have not been adopted, the EPA determines whether the designated uses were adopted consistent with the requirements at 40 CFR 131.10 and whether the bases for the use designations (e.g., UAAs) have been reviewed every three years, as required by 40 CFR 131.20(a).
- The EPA determines whether the state and tribal criteria are sufficient to protect the designated uses by ensuring that all numeric criteria are based on Section 304(a) guidance, Section 304(a) guidance modified to reflect site-specific conditions, or other scientifically defensible methods. The EPA's decision to approve or disapprove criteria based on site-specific calculations or alternative scientific methods is based on whether the resulting criteria are sufficient to protect the designated use and whether the supporting scientific methods and assumptions are valid and adequate. The EPA's decision to approve or disapprove such criteria is not based on whether the resulting criteria are more or less stringent than the EPA's Section 304(a) national recommended criteria.
- The EPA determines whether narrative "free from" criteria are included in state and tribal WQS and protect all waters at all flows. The EPA also evaluates whether the WQS include a method for implementing any narrative "free from" criteria for toxic pollutants for situations in which the EPA has not issued Section 304(a) guidance for a particular toxicant or where the toxicant causing the problem is unknown.

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<sup>2</sup> Under Section 510 of the [CWA](#), state and tribal WQS may be more stringent than the EPA's minimum requirements.

- The EPA determines whether the state or tribe has included criteria for Section 307(a) "priority pollutants" sufficient to satisfy the requirements of Section 303(c)(2)(B).
- The EPA determines whether designated uses and criteria apply throughout the entire waterbody.
- The EPA determines whether the information and analyses provided in support of the new or revised WQS indicate that instream designated uses and criteria will provide for the attainment and maintenance of downstream WQS.

Antidegradation and General Policies:

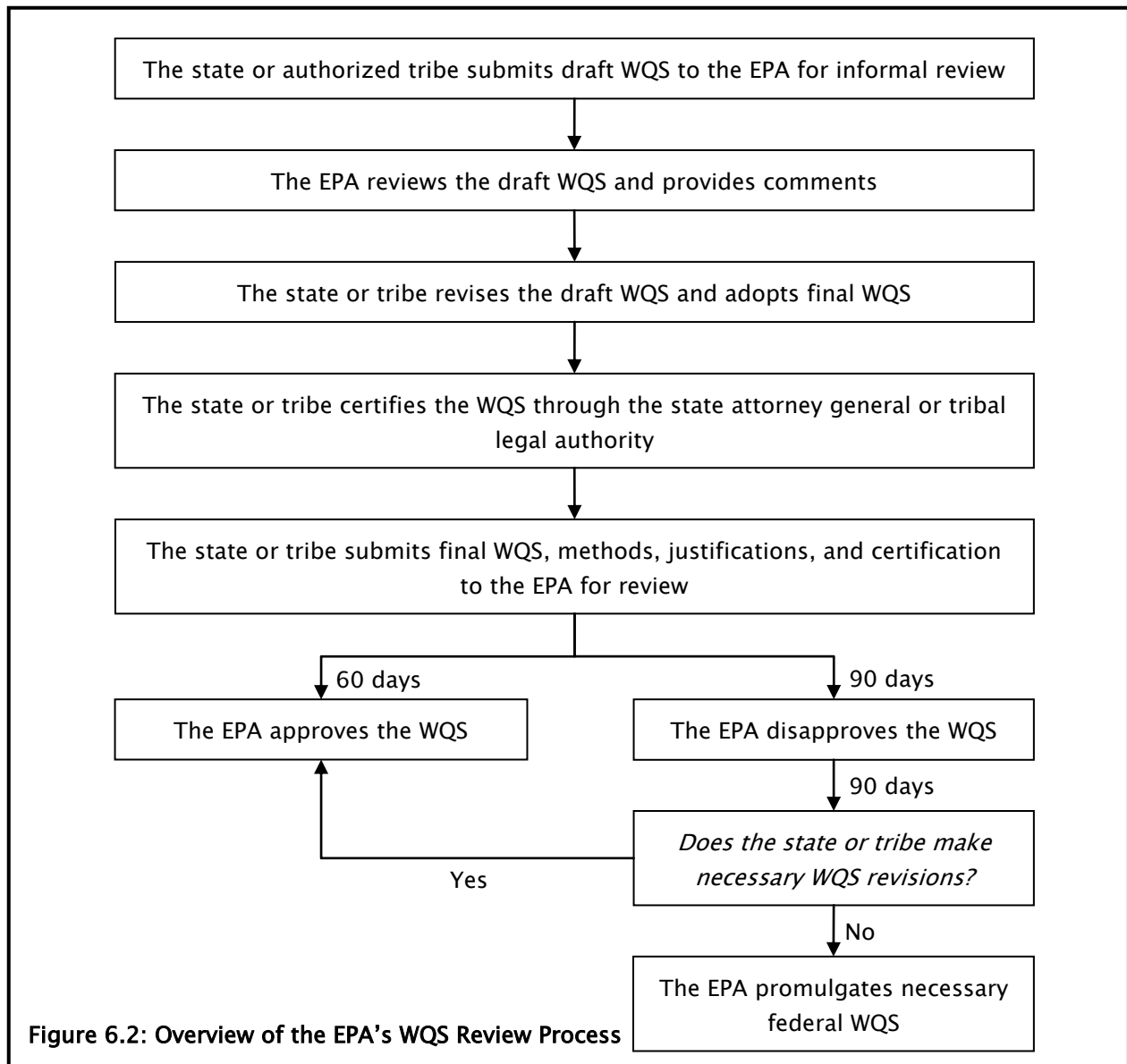
- The EPA determines whether state and tribal antidegradation policies meet the requirements of 40 CFR 131.12.
- The EPA determines whether the state or tribe has provided or referenced procedures for implementing the antidegradation policy.
- Where general policies (e.g., mixing zone, variance, and low-flow policies) are included in the state or tribal WQS, the EPA determines whether the policies are consistent with the CWA and 40 CFR Part 131.

Procedural:

- The EPA determines whether the state or tribe has met the minimum applicable requirements for a WQS submission contained in 40 CFR 131.6.
- The EPA determines whether the state or tribe has complied with the procedural requirements contained in 40 CFR 131.20 (e.g., public participation) for conducting WQS reviews.
- The EPA determines whether the new or revised WQS are consistent with the CWA and 40 CFR Part 131.
- The EPA reviews comments and suggestions that the public submitted on proposed state and tribal WQS to determine if any comments indicate that the WQS are not consistent with the CWA and 40 CFR Part 131.

After reviewing the new or revised state or tribal WQS, the EPA approves or disapproves such new or revised WQS.

Figure 6.2 provides an overview of the EPA's WQS review process.



### 6.2.1 Policies and Procedures Related to EPA Approvals

On March 30, 2000, the EPA revised its regulation at [40 CFR 131.21](#) that specifies when new or revised state and tribal WQS become effective for [CWA](#) purposes. Commonly called “the [Alaska rule](#)” (40 CFR 131.21(c)(2), 65 FR 24641, April 27, 2000), this regulation mandates that new or revised WQS adopted by states or authorized tribes and submitted to the EPA after May 30, 2000, must be approved by the EPA before they become applicable WQS for actions under the CWA (e.g., establishment of water quality-based effluent limitations under Section 301(b)(1)(C) or development of total maximum daily loads under Section 303(d)(1)(C)). The Alaska rule also provides that WQS already submitted to the EPA prior to May 30, 2000, are in effect for CWA purposes regardless of

whether they were approved by the EPA unless and until the EPA has either promulgated a more stringent WQS for the state or tribe or approved a change, deletion, or addition to the specific WQS.

Consistent with 40 CFR 131.21(a)(1) and Section 303(c)(3), if the EPA determines that new or revised WQS adopted by a state or tribe meet the requirements of the CWA and 40 CFR Part 131, the EPA must notify the state or tribe within 60 days that the WQS are approved. If particular events (e.g., state implementation decisions, pending federal legislation pertaining to WQS requirements) could result in a failure of the approved WQS to continue to meet the requirements of the CWA, the EPA should identify these events in the approval letter and the administrative record for the action in order to guide future state and tribal review and revision activities.

When only a portion of the adopted state or tribal WQS submission meets the requirements of the CWA and 40 CFR Part 131, the EPA may approve only that portion.

The EPA could also issue a conditional approval. Conditional approvals should only be used as the exception, not the rule, and in limited circumstances. For additional information on conditional approvals, see [Guidance for the Use of Conditional Approvals for State Water Quality Standards \(1989\)](#).

The EPA notes that requests for clarification or additional information from the state or tribe regarding their new or revised WQS are not EPA approval or disapproval actions under Section 303(c).

The EPA has compiled state and tribal WQS that are currently in effect for CWA purposes (i.e., those approved by the EPA for CWA purposes or are otherwise in effect). Commonly referred to as the "[WQS Repository](#)," this webpage includes a clickable map that is useful for finding currently effective state and tribal WQS.

### **6.2.2 Policies and Procedures Related to EPA Disapprovals**

Consistent with [40 CFR 131.21\(a\)\(2\)](#) and Section 303(c)(3) of the [CWA](#), if the EPA determines that the new or revised state or tribal WQS do not meet the requirements of the CWA and 40 CFR Part 131, the EPA must disapprove such WQS and notify the state or authorized tribe within 90 days. In the event of a disapproval action, the EPA must also specify the revisions that the state or tribe must adopt to meet CWA requirements. If the EPA disapproves a new or revised WQS, that WQS is not in effect for CWA purposes. In such a case, the state or tribe would continue to implement the previous EPA-approved WQS until the state or tribe remedies the disapproval action and the EPA approves such remedy or until the EPA promulgates a new or revised WQS.

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## 6.3 EPA Promulgation of Federal Water Quality Standards

### 6.3.1 When the EPA Might Promulgate Federal Water Quality Standards

As a matter of policy, the EPA prefers that states and authorized tribes adopt their own WQS. However, under Section 303(c)(4) of the [CWA](#) and [40 CFR 131.22](#), the EPA must promptly propose and promulgate federal WQS if either of the following conditions occur:

- The EPA determines that a new or revised WQS submitted by a state or tribe is not consistent with CWA requirements and 40 CFR Part 131, and the state or tribe does not adopt acceptable replacement WQS within 90 days.
- In any case where the EPA Administrator makes an “Administrator determination” that a new or revised WQS is necessary to meet CWA requirements and 40 CFR Part 131.

As described in Section 6.2.2, if the EPA determines, under Section 303(c)(4)(A) and 40 CFR 131.22(a), that new or revised WQS adopted by a state or tribe are not consistent with (i.e., do not meet the requirements of) the CWA and 40 CFR Part 131, the EPA must disapprove such WQS within 90 days, specifying the changes necessary to meet CWA requirements. However, under the CWA, the EPA must promptly propose federal WQS if the state or tribe fails to adopt and submit the necessary revisions within 90 days after notification of the disapproval.

If the EPA Administrator makes an “Administrator’s determination,” under Section 303(c)(4)(B) and 40 CFR 131.22(b), that a new or revised WQS is necessary to meet the requirements of the CWA, the EPA must promptly propose such WQS and then promulgate such WQS no later than 90 days after publication of the EPA’s proposed WQS. However, the EPA is not required to promulgate a new or revised WQS if, prior to the EPA’s promulgation, the state or tribe adopts and submits a new or revised WQS that the EPA determines to be consistent with the CWA.

The EPA has compiled a list of [federally promulgated WQS](#).

### 6.3.2 When the EPA Would Withdraw Federally Promulgated Water Quality Standards

Where the EPA has promulgated WQS for a state or tribe, the EPA withdraws its federally promulgated WQS after the EPA determines that revised state or tribal WQS meet the requirements of the [CWA](#) and [40 CFR Part 131](#) and approves such WQS.



# **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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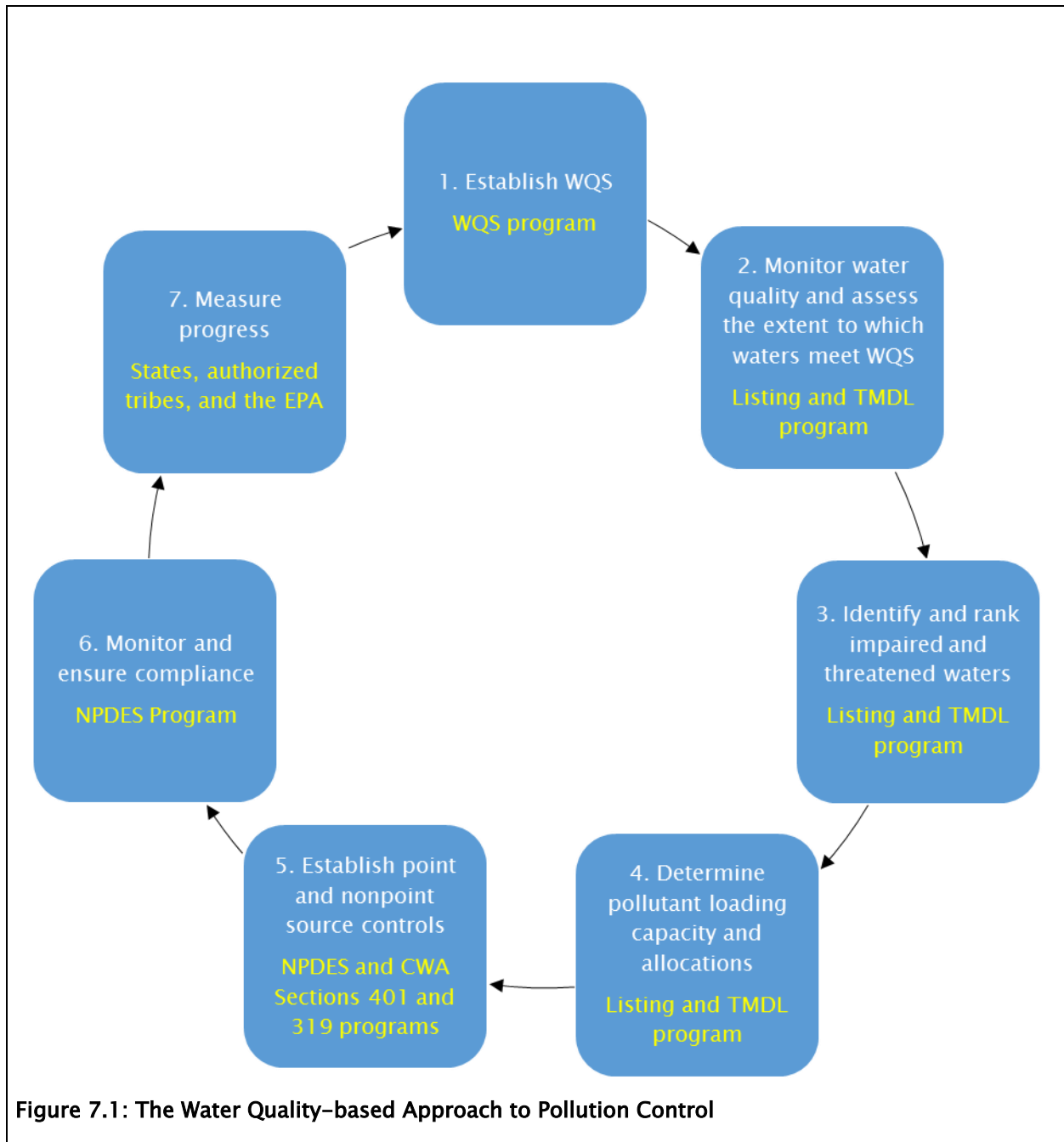
## Introduction

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.<sup>1</sup>

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.

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<sup>1</sup> 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.



## 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](#).

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## 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 \(2003\)](#).

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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](#).

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## 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 waterbodies 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 waterbodies 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.

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## 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](#).

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## 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.<sup>2</sup> An NPDES permit is

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<sup>2</sup> Section 402 of the [CWA](#) establishes the NPDES program. Note that the CWA provides exemptions

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

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for certain types of point sources.

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 \(2010\)](#).

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## 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](#).

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## 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.