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# Wyoming's Methods for Determining Surface Water Quality Condition

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## List of Acronyms

Chapter 1	Chapter 1 of the Wyoming Water Quality Rules and Regulations
CFR	Code of Federal Regulations
CWA	Federal Clean Water Act
QA/QC	Quality Assurance/Quality Control
SAP	Sampling and Analysis Plan
SEO	Wyoming State Engineer’s Office
TMDL	Total Maximum Daily Load
UAA	Use Attainability Analysis
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department
W.S.	Wyoming Statute

## 1. Introduction

In 1972, Congress enacted the Federal Water Pollution Control Act, otherwise known as the Clean Water Act ([CWA](#)). The purpose of the CWA is to promote the restoration and/or maintenance of the chemical, physical and biological integrity of our nation's surface waters and to support the *protection and propagation of fish, shellfish, and wildlife and recreation in and on the water*. The U.S. Environmental Protection Agency ([USEPA](#)) is charged with administering the CWA. However, Section 101(b) of the CWA states that *it is the policy of Congress to recognize, preserve, and protect the primary responsibilities and rights of States to prevent, reduce, and eliminate pollution, to plan the development and use (including restoration, preservation, and enhancement) of land and water resources, and to consult with the Administrator in the exercise of his authority under this Act*. As such, the Wyoming Department of Environmental Quality, Water Quality Division (WDEQ/WQD) administers the Clean Water Act in Wyoming.

### 1.1 Section 305(b) Requirements

Section 305(b) of the CWA requires that each state prepare and submit a biennial report to USEPA by April 1<sup>st</sup> of even numbered years. The report must contain a description of the navigable waters of the state for the preceding year, including the extent to which current conditions allow for the *protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water*. Section 305(b) also requires each state to report the water quality and the elimination of pollutants necessary for designated use support. Specifically, each state is to identify waters not meeting the above conditions, recommend strategies to achieve these objectives and to estimate the environmental impacts, economic and social costs and benefits and the predicted timeline for project completion. Lastly, Section 305(b) requires that the sources and extent of non-point source pollution in each state be estimated, including a description of the current program used to mitigate these pollutants and associated financial costs.

### 1.2 Section 303(d) Requirements

Section 303(d) of the CWA requires that states identify and list waters for which the effluent limits outlined in Section 301 are not stringent enough to implement any water quality standard applicable to such waters. 40 CFR 130.7 outlines the requirements of section 303(d). Each state must submit a 303(d) List of impaired and threatened waters to USEPA by April 1<sup>st</sup> of each even numbered year. USEPA must review and approve or disapprove the 303(d) List within 30 days of submittal. The 303(d) List must also include waters for which controls on thermal discharges under section 301 of the CWA are not stringent enough to assure the protection and propagation of a balanced population of shellfish, fish, and wildlife. A TMDL is the amount of pollution a waterbody can receive, and still meet its designated uses. Section 303(d) requires that states develop a separate [TMDL](#) for each pollutant/segment combination on the 303(d) List. Waters on the 303(d) List must be prioritized for TMDL development based on the severity of each pollutant/segment combination or listing. Wyoming's biennial Integrated 305(b) and 303(d) Report (hereafter referred to as the Integrated Report) combines the requirements of both CWA sections into a single document. WDEQ provides a 45-day public comment period for the draft Integrated Report, followed by a formal response to comments. There is then a two week period during which the public may contact the Water Quality Division Administrator and request a review of the proposed 303(d) List before the Water and Waste Advisory Board where there are major objections to proposed waterbodies on the list. The Water and Waste Advisory Board may consider the comments and objections and make recommendations to WDEQ.

## 2. Data Requirements

Much of the data and information used in making designated use support determinations are generated by [WDEQ's Surface Water Quality Monitoring Program](#). Surface Water Monitoring Program studies typically result in final reports, which are available on [WDEQ's webpage](#). In addition, WDEQ routinely reviews water quality data from a variety of other sources, including Wyoming's 34 conservation districts, federal, state and local government agencies, non-profit organizations and the private sector. WDEQ solicits data every two years using the department's automated electronic mailing list or listserv. As part of administering the CWA in Wyoming, 40 CFR 130.7(b)(5) requires that WDEQ *shall assemble and evaluate all existing and readily available water quality-related data and information to develop the list required by §§130.7(b)(1) and 130.7(b)(2). At a minimum "all existing and readily available water quality-related data and information" includes but is not limited to all of the existing and readily available data and information about the following categories of waters:*

- (i) *Waters identified by the State in its most recent section 305(b) report as "partially meeting" or "not meeting" designated uses or as "threatened";*
- (ii) *Waters for which dilution calculations or predictive models indicate nonattainment of applicable water quality standards;*
- (iii) *Waters for which water quality problems have been reported by local, state, or federal agencies; members of the public; or academic institutions. These organizations and groups should be actively solicited for research they may be conducting or reporting. For example, university researchers, the United States Department of Agriculture, the National Oceanic and Atmospheric Administration, the United States Geological Survey, and the United States Fish and Wildlife Service are good sources of field data; and*
- (iv) *Waters identified by the State as impaired or threatened in a nonpoint assessment submitted to EPA under section 319 of the CWA or in any updates of the assessment.*

All water quality data and other information are thoroughly evaluated by Surface Water Quality Monitoring and/or Water Quality Assessment Program personnel against the surface water quality standards contained in [Chapter 1 of Wyoming's Water Quality Rules and Regulations \(WDEQ, 2013a\)](#). Water quality data and other information must be submitted to the Water Quality Assessment Program no later than April 15 during odd-numbered (e.g., 2019) years to be considered for inclusion in the subsequent Integrated Report (e.g., 2020). Any supplemental data or other information deemed necessary by WDEQ must be provided promptly as requested. Incomplete data, or those submitted beyond the April 15 deadline are typically considered toward the subsequent Integrated Report (e.g., 2022).

### Credible Data

[The Wyoming Environmental Quality Act \(WDEQ, 2016a\)](#), Wyoming Statute (W.S.) § 35-11-103(c)(xix), and Section 2(a)(i) of Chapter 1 define credible data as *scientifically valid chemical, physical and biological monitoring data collected under an accepted sampling and analysis plan including quality control, quality assurance procedures and available historical data*. Section 35(b) of Chapter 1 requires that *credible data be collected on each water body, and shall be considered for purposes of characterizing the integrity of the water body including consideration of soil, geology, hydrology, geomorphology, climate, stream succession and the influences of man upon the system. These data in combination with other available and applicable information shall be used through a weight-of-evidence approach to designate uses and determine whether those uses are being attained*. Chapter 1, Section 35(d) requires that *credible data shall be utilized in determining a water body's attainment of designated uses, although a less than complete set of data may be used to make a decision on designated use support (i.e., attainment) in instances where numerical standards contained in these rules are exceeded or on ephemeral or intermittent water bodies where chemical or biological sampling is not practical or*

*feasible* (Chapter 1, Section 35(b)). Hereafter, within this document, the use of the term credible data will refer to the definition above.

As described in Section 35(a)(i) of Chapter 1, data must be collected *using accepted referenced laboratory and field methods employed by a person who has received specialized training and has field experience in developing a monitoring plan, a quality assurance plan, and employing the methods outlined in such plans; or works under the supervision of a person who has these qualifications. Specialized training includes a thorough knowledge of written sampling protocols and field methods such that the data collection and interpretation are reproducible, scientifically defensible, and free from preconceived bias.* Section 35(a)(ii) of Chapter 1 states that *data must include documented quality assurance, consisting of a plan that details how environmental data operations were planned, implemented, and assessed with respect to quality during the duration of the project.* A variety of scientifically defensible laboratory and field methods may be used to collect and analyze data for the purpose of making designated use support determinations (i.e., assessments). [WDEQ's Manual of Standard Operating Procedures for Sample Collection and Analysis](#) contains the standard procedures used by WDEQ's Surface Water Quality Monitoring Program.

All data and supporting information used for designated use support determinations must be collected following a pre-approved sampling and analysis plan (SAP) and quality assurance project plan (QAPP). SAP development guidance is available on [WDEQ's website](#).

All SAPs must include:

- (i) study goals and objectives
- (ii) site location information (coordinates and map)
- (iii) overall study design
- (iv) water quality parameters
- (v) sampling duration and frequency
- (vi) sample collection and analytical methods
- (vii) quality assurance project plan (QAPP)
- (viii) documentation indicating that the entity has obtained permission to sample study sites on State, National Park Service and private lands (this includes permission to access all study sites)
- (ix) documentation indicating the training and qualifications of samplers

Copies of supporting documentation, including completed laboratory data sheets, field forms, notes, instrument calibration logs, copies chain of custody forms, photographs and other relevant information must accompany all data submissions. The [QA/QC Program](#) uses the criteria listed in Appendix A to evaluate the suitability of water quality data and other information for determining designated use support. In addition, QA/QC Program personnel may choose to conduct field audits and/or collect additional samples as part of the QA/QC review process.

To encourage collaboration and information and data sharing, local conservation districts and land management agencies will be notified by WDEQ prior to all site visits related to surface water quality monitoring, water quality assessment, and QA/QC.

### **Wyoming's Weight-of-Evidence Approach**

Section 35(b) of Chapter 1 requires that a weight-of-evidence approach be used to analyze credible data when making designated use support determinations. Wyoming's weight-of-evidence approach evaluates all relevant data and other information and uses scientific deduction to assess the designated use support of surface waters. In using this approach, WDEQ may utilize statistical tests, analytical procedures and evaluate additional data to ensure the validity, representativeness and objectiveness of data. WDEQ's weight-of-evidence approach has been adapted from [Section 3, Volume 2 of USEPA's Guidelines for](#)

[Preparation of the Comprehensive State Water Quality Assessments, 305\(b\) Reports and Annual Electronic Updates: Supplement EPA-841-B-97-002B \(USEPA, 1997\)](#) and [Section IV of USEPA's Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303\(d\), 305\(b\) and 314 of the Clean Water Act \(USEPA, 2005\)](#).

### **Historic Data**

Section 2(b)(xxii) of Chapter 1 defines historic data as *scientifically valid data that is more than five years old, or qualitative information that adds some factual information on the historic conditions of a water body. This historic qualitative information may include photographs, journals and factual testimony of persons who have lived near or relied upon the water body, and old records on water use and water conditions.* WDEQ uses the date when data and other information are first received by the Water Quality Assessment Program or Quality Assurance Quality Control program to define the 5 year period described above. For example, if the Water Quality Assessment Program received a water quality report on October 13, 2017, all data and other information within the report that is dated before October 13, 2012 would be considered historic. Following recommendations in USEPA's [Consolidated Assessment and Listing Methodology \(CALM\) \(USEPA, 2002\)](#), WDEQ will only evaluate historical data toward designated use support determinations if they are considered representative of current water quality conditions and they are evaluated with data collected within the previous five years.

### **Streamflow Conditions**

Section 11(a) of Chapter 1 states that *numeric water quality standards shall be enforced at all times except during periods below low flow.* Low flow can be demonstrated using methods described in Section 11(a)(i), (ii) and (iii) of Chapter 1. WDEQ often reviews streamflow data before making designated use support determinations using numeric criteria. As stated in Section 11(c), *the narrative water quality standards in Sections 14, 15, 16, 17, 28 and 29(b) of these regulations shall be enforced at all stream-flow conditions.* None of the other narrative criteria in Chapter 1 are enforced during periods below low flow.

### **Turbidity**

Section 23 (a) of Chapter 1 states that in all cold water fisheries and/or drinking water supplies (Classes 1, 2AB, 2A and 2B), the discharge of substances attributable to or influenced by the activities of man shall not be present in quantities which would result in a turbidity increase of more than ten (10) nephelometric turbidity units (NTUs). Section 23 (b) states that in all warm water or nongame fisheries (Classes 1, 2AB, 2B and 2C), the discharge of substances attributable to or influenced by the activities of man shall not be present in quantities which would result in a turbidity increase of more than 15 NTUs. Due to the variable nature of turbidity data, WDEQ requires that credible data and a weight of evidence approach be used to make designated use support determinations with turbidity data.

## **3. Designated Uses and Classifications**

Wyoming's Antidegradation Policy, described in Section 8(a) of Chapter 1 states that *water uses in existence on or after November 28, 1975 and the level of water quality necessary to protect those uses shall be maintained and protected.* Section 2(b)(ix) of Chapter 1 defines designated uses as *those uses specified in water quality standards for each water body or segment whether or not they are being attained.* Designated uses are equivalent to management goals or expectations for each of Wyoming's surface waters, and are assigned to each water using a tiered classification system described in Section 4 of Chapter 1. This approach places waters into Classes 1-4 (see Table 1) based on their designated uses, with Class 1 waters being managed for the highest and Class 4 the lowest water quality, respectively. Wyoming's current surface water classifications are contained within the [Wyoming Surface Water](#)

[Classification List \(WDEQ, 2013b\)](#). Section 3 of Chapter 1 states that *the objectives of the Wyoming pollution control program are to provide, wherever attainable, the highest possible water quality commensurate with the following nine uses:*

**Drinking water** - *The drinking water use involves maintaining a level of water quality that is suitable for potable water or intended to be suitable after receiving conventional drinking water treatment.*

**Fisheries** - *The fisheries use includes water quality, habitat conditions, spawning and nursery areas, and food sources necessary to sustain populations of cold water game fish, warm water game fish and nongame fish. This use does not include the protection of aquatic invasive species or other fish which may be considered "undesirable" by the Wyoming Game and Fish Department or the U.S. Fish and Wildlife Service within their appropriate jurisdictions.*

**Aquatic life other than fish** - *This use includes water quality and habitat necessary to sustain populations of organisms other than fish in proportions which make up diverse aquatic communities common to the waters of the state. This use does not include the protection of human pathogens, insect pests, aquatic invasive species or other organisms which may be considered "undesirable" by the Wyoming Game and Fish Department or the U.S. Fish and Wildlife Service within their appropriate jurisdictions.*

**Fish consumption** - *The fish consumption use involves maintaining a level of water quality that will prevent any unpalatable flavor and/or accumulation of harmful substances in fish tissue.*

**Recreation** - *Recreational use protection involves maintaining a level of water quality which is safe for human contact. It does not guarantee the availability of water for any recreational purpose. The recreational designated use includes primary contact recreation and secondary contact recreation subcategories.*

**Wildlife** - *The wildlife use includes protection of water quality to a level which is safe for contact and consumption by avian and terrestrial wildlife species.*

**Agriculture** - *For purposes of water pollution control, agricultural uses include irrigation and/or livestock watering.*

**Industry** - *The industrial use involves maintaining a level of water quality useful for industrial purposes.*

**Scenic value** - *Scenic value use involves the aesthetics of a waterbody (odor, color, taste, settleable solids, floating solids, suspended solids and solid waste) and is not necessarily related to general landscape appearance.*

**Table 1.** Wyoming’s surface water classifications (far left column) and designated uses (top row). For each surface water class, a Yes indicates that a designated use is protected, while a No indicates that the use is not protected.

	Drinking water	Cold water game fish	Warm water game fish	Nongame fish	Fish consumption	Aquatic life other than fish	Recreation <sup>2</sup>	Wildlife	Agriculture	Industry	Scenic value
<b>1</b>	<i>Yes<sup>1</sup></i>	<i>Yes<sup>1</sup></i>	<i>Yes<sup>1</sup></i>	<i>Yes<sup>1</sup></i>	<i>Yes<sup>1</sup></i>	<i>Yes</i>	Yes	Yes	Yes	Yes	Yes
<b>2AB</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>2A</b>	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>2B</b>	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>2C</b>	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>2D</b>	No	If present	If present	If present	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>3A</b>	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>3B</b>	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>3C</b>	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>3D</b>	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>4A</b>	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
<b>4B</b>	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
<b>4C</b>	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes

<sup>1</sup> Class 1 waters are not necessarily protected for all uses (indicated by an italicized "Yes") in all circumstances. For example, all surface waters in National Parks and Wilderness Areas are Class 1; however, all such waters are not necessarily managed for fisheries or aquatic life other than fish uses (e.g., hot springs, ephemeral waters and wet meadows).

<sup>2</sup> Wyoming’s recreational designated use is subdivided into primary and secondary recreational uses, but WDEQ uses only a single recreational designated use in assigning surface water classifications.

## 4. Designated Use Support Determinations

Designated use support determinations for Wyoming’s surface waters are made on a biennial basis during preparation of the Integrated Report. Chapter 1 contains all of Wyoming’s numeric and narrative criteria, which define limits for the protection of the state’s designated uses. A numeric criterion is comprised of a quantifiable unit of measurement for each parameter and a duration and frequency of exposure; narrative criteria are descriptive parameters not easily expressed as quantitative values or for which numeric criteria have yet to be developed. Section 2 of this document provides a detailed description of WDEQ’s data requirements for making designated use support determinations. All data and other information used in making designated use support determinations, including those generated by WDEQ or from outside sources are available for public review. WDEQ’s methods for determining designated use support for each of the state’s designated uses are described separately below.

### 4.1 Drinking water

Section 3(d) of Chapter 1 states that *the drinking water use involves maintaining a level of water quality that is suitable for potable water or intended to be suitable after receiving conventional drinking water treatment.*

USEPA administers the [Public Drinking Water Program](#) in Wyoming. WDEQ does not extensively monitor support of this use on surface waters, but does periodically collaborate with USEPA to identify issues with drinking water supplies. For numeric criteria, Section 18 of Chapter 1 states that *in all Class 1, 2AB and 2A waters, the "Human Health Consumption of Fish and Drinking Water" values listed in Appendix B of these regulations shall not be exceeded. In all Class 2B, 2C and 2D waters, the "Human Health Consumption of Fish" (consumption of aquatic organisms) values shall not be exceeded. In certain waters, the criteria listed in Appendix B of these regulations may not be appropriate due to unique physical or chemical conditions. In such cases, human health values may be established using the site-specific procedures outlined in the references listed in Appendix E or other scientifically defensible methods.* The drinking water use is also evaluated using numeric criteria in Sections 22 and 23 and narrative criteria in Sections 13, 14, 15, 16, 17 and 29 of Chapter 1. Evaluations of numeric criteria may or may not require the use of credible data, as defined in Section 2 (a)(i) of Chapter 1. Credible data are required when evaluating narrative criteria.

**Fully supporting** - Representative data show no exceedance of any drinking water criteria within at least 2 separate years of any 3-year period.

**Fully supporting, but threatened** - Representative data show no exceedance of any drinking water criteria. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supporting** - Representative data show that at least one drinking water criterion is exceeded.

**Indeterminate** - Representative data, collected during a designated use support assessment, are either insufficient or inconclusive and designated use support cannot be determined.

**Not assessed** - Representative data are not available to determine designated use support.

## 4.2 Fisheries

Section 3(b) of Chapter 1 states that *the fisheries use includes water quality, habitat conditions, spawning and nursery areas, and food sources necessary to sustain populations of cold water game fish, warm water game fish and nongame fish. This use does not include the protection of aquatic invasive species or other fish which may be considered "undesirable" by the Wyoming Game and Fish Department or the U.S. Fish and Wildlife Service within their appropriate jurisdictions.*

Wyoming has three separate sub-categories for the fisheries use: cold water game fisheries, warm water game fisheries and nongame fisheries. Fisheries designated use support is evaluated using the numeric criteria listed in Sections 21, 23, 24, 25, 26 and Appendices B (listed under aquatic life acute and chronic values), C and D and narrative criteria in Sections 12, 13, 15, 16, 22, 26, 28, 29 and 32 of Chapter 1. The acute aquatic life criteria listed in Appendix B constitute the highest concentration of a physical or chemical parameter to which an aquatic community can be exposed for one hour without deleterious effects. Chronic aquatic life criteria represent the highest average concentration of a physical or chemical parameter to which an aquatic community can be exposed to for four days without deleterious effects. The average concentration of four evenly spaced samples is preferred by WDEQ for evaluating acute (i.e., one sample every 15 minutes) and chronic (i.e., one sample per day) criteria for designated use support determinations. However, it is generally assumed that a single sampling event represents the water quality condition for these longer time periods.

Dissolved oxygen, water temperature and pH and can be influenced by a variety of other water quality pollutants, such as sedimentation and nutrient enrichment. Sections 24, 25 and 26 specify that for Class 1, 2 and 3 waters, anthropogenic pollution shall not be present in quantities that would change dissolved oxygen, temperature and pH to levels that would adversely affect aquatic life or impair designated uses.

WDEQ uses a weight of evidence approach to determine whether any of these three pollutants are causing an impairment to fisheries or aquatic life other than fish uses and whether the source(s) are anthropogenic or natural. This process includes an evaluation of representative credible data and information.

WDEQ does not currently have fish-based biological surface water quality models and does not typically collect and identify fish during water quality monitoring. However, fish community structure, fish kill, fish tissue and/or other data and information can be used in a weight of evidence evaluation of narrative aquatic life criteria. Fish populations and communities can be influenced by a variety of factors such as stocking rates, fishing pressure, stream connectivity and competitive displacement via invasive species that will be considered during the weight of evidence evaluation.

**Fully supporting** - Representative data show no exceedance of any fisheries or aquatic life other than fish use criteria within at least 2 separate years of any 3-year period.

**Fully supporting, but threatened** - Representative data show no exceedance of any fisheries or aquatic life other than fish criteria. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supporting** - Representative data show that at least one fisheries or aquatic life other than fish criterion is exceeded for at least 2 separate years within a 3-year period.

**Indeterminate** - Representative data, collected during a designated use support assessment, are either insufficient or inconclusive and designated use support cannot be determined.

**Not assessed** - Representative data are not available to determine designated use support.

### 4.3 Aquatic life other than fish

Section 3(g) of Chapter 1 states that the aquatic life other than fish use *includes water quality and habitat necessary to sustain populations of organisms other than fish in proportions which make up diverse aquatic communities common to the waters of the state. This use does not include the protection of human pathogens, insect pests, aquatic invasive species or other organisms which may be considered "undesirable" by the Wyoming Game and Fish Department or the U.S. Fish and Wildlife Service within their appropriate jurisdictions.*

Aquatic life other than fish designated use support can be evaluated using numeric and/or narrative criteria. There are currently no criteria in Chapter 1 that are based solely on biological community measures. Numeric criteria are listed in Section 21 and Appendices B (listed under aquatic life acute and chronic values) and C of Chapter 1. The acute aquatic life criteria listed in Appendix B constitute the highest concentration of a physical or chemical parameter to which an aquatic community can be exposed for one hour without deleterious effects. Chronic aquatic life criteria represent the highest average concentration of a physical or chemical parameter to which an aquatic community can be exposed to for four days without deleterious effects. The ammonia chronic criteria represent the highest average concentration over a 30-day period. The average concentration of four evenly spaced samples is preferred by WDEQ for evaluating acute (i.e., one sample every 15 minutes) and chronic (i.e., one sample per day over four days or approximately one sample per week over 30-days for ammonia) criteria for designated use support determinations. However, it is generally assumed that a single sampling event represents the water quality condition for these longer time periods. Narrative criteria for the aquatic life other than fish use can be found in Sections 12, 13, 15, 16, 21, 22, 24, 25, 26, 28, 29 and 32 of Chapter 1. These narrative criteria must be evaluated with credible physical, chemical and biological data using a weight of evidence approach. Such studies typically compare the physical, chemical and biological condition at a reference or control site(s) to that observed at one or more targeted sites. For a narrative

aquatic life criterion to be exceeded, a study must show that one or more physical or chemical substance(s) is degrading an aquatic community.

Dissolved oxygen, water temperature and pH and can be influenced by a variety of other water quality pollutants, such as sedimentation and nutrient enrichment. Sections 24, 25 and 26 specify that for Class 1, 2 and 3 waters, anthropogenic pollution shall not be present in quantities that would change dissolved oxygen, temperature and pH to levels that would adversely affect aquatic life or impair designated uses. WDEQ uses a weight of evidence approach, including whether the source(s) are anthropogenic or natural, to determine whether these criteria are exceeded. This process includes an evaluation of representative credible data and information.

Aquatic life other than fish designated use support determinations are used by WDEQ as surrogate measures of fisheries, agricultural, wildlife and industrial designated use support.

WDEQ commonly uses macroinvertebrate, fish, algae, diatom and/or macrophyte biological community metrics to evaluate narrative criteria to protect aquatic life. Biological data are required to be used as part of a weight of evidence evaluation of narrative aquatic life criteria.

### ***Macroinvertebrates***

Macroinvertebrate communities in naturally perennial wadeable stream and river segments are primarily evaluated by WDEQ using targeted riffle macroinvertebrate surveys. This is the preferred method of sampling benthic macroinvertebrates in wadeable stream and rivers of Wyoming because: 1) riffle habitat generally offer the most diverse and abundant assemblage of benthic macroinvertebrates; 2) it is a quantitative procedure whereby accurate estimates of richness, relative abundance and density can be derived from the results; 3) results are reproducible in that generally the same riffle habitat can be sampled repeatedly over time; and 4) Wyoming's two primary biological indicators for determining aquatic life use support - Wyoming Stream Integrity Index (WSII) and the Wyoming River InVertebrate Prediction And Classification System (WYRIVPACS) – were developed exclusively for analysis of benthic macroinvertebrate data collected from wadeable perennial streams using WDEQ's targeted riffle method. Additional analytical techniques may also be used with targeted riffle data to provide supplemental evidence to the WSII and WYRIVPACS. These analyses are included in a weight-of-evidence evaluation of aquatic life uses but cannot be used as a substitute for the models. Examples include comparing communities between sites using select metrics (e.g., taxonomic diversity, relative abundance, % algae scrapers), other appropriate biological models, comparisons to findings from scientific literature, or various statistical methods.

The [WSII](#) (Wyoming Stream Integrity Index) is comprised of eleven independent bioregion-specific multimetric models that are used to compare a macroinvertebrate community of unknown condition (observed) to that of a reference community (expected) (Hargett, 2011). Model scores are calculated by averaging the standardized values of several benthic macroinvertebrate community metrics representing richness, composition, life history, functional feeding, habitat preference and tolerance/diversity categories. Scores that exceed the 25<sup>th</sup> percentile of reference calibration scores are identified as being full support (i.e., within expected reference condition). Index scores below the 25<sup>th</sup> percentile of reference calibration scores are split into two unequal portions. Scores in the upper 1/3 of this range are identified as indeterminate, whereas scores that fall in the lower 2/3 are assigned a partial/non-support rating (i.e., below biological expectations).

[WYRIVPACS](#) (Wyoming River Invertebrate Prediction and Classification System) is a predictive biological model used to compare the taxonomic composition of a macroinvertebrate community of unknown condition (observed) to that of a reference community (expected) ([Hargett, 2012](#)). The eight predictor variables used in the model are longitude, latitude, watershed area, alkalinity and categorical variables for the individual or combined bioregions of the Southern Rockies and Bighorn Mountains, Black Hills, High

Valleys & Upper North Platte and Southern Foothills & Laramie Range. The deviation, or ratio of the observed (O) community from that which is expected (E), or O/E value, is used as a measure of biological condition for each of the eleven bioregions occurring within Wyoming. O/E values of 1 represent the best possible biological condition, whereas values <1 are suggestive of some degree of biological degradation. O/E values within each of the eleven bioregions, are codified into one of three narrative aquatic life designated use-support categories: full support (i.e., within expected reference condition), indeterminate and partial/non-support (i.e., below biological expectations).

Macroinvertebrate data evaluated using the WSII and WYRIVPACS are typically collected in the same manner as those used to develop the models. Specifically, samples are collected using a Surber Sampler in riffles between July 15 and October 31 for plains and basin streams and August 1 to October 31 for mountain streams. Use of WSII and WYRIVPACS on the following five types of perennial wadeable streams may be limited because they are marginally represented in the reference datasets of the models:

- Perennial wadeable stream segments >9,000 ft in elevation
- Perennial wadeable stream segments with watershed areas <5 mi<sup>2</sup>
- Perennial wadeable reservoir tailwater streams with the exception of those <1 mile below dam
- Perennial wadeable streams in extreme southwestern Wyoming that are fed by both springs and snowmelt
- Spring-fed perennial wadeable streams within the interior of the Bighorn and Wyoming Basins

WDEQ will evaluate the applicability of the WSII and WYRIVPACS for a project that occurs on any of these five perennial stream and river segment types. At a minimum, such projects must include sufficient justification for the use of the models *along with* additional lines of biological evidence (other than results from the WSII and WYRIVPACS) for use in the standard weight-of-evidence approach to assess aquatic life uses. An example of sufficient justification for model use may include a comparison of the watershed and expected physical and chemical characteristics at a site of unknown condition to those from similar reference sites that were used to construct the models.

The results of the WSII and WYRIVPACS are combined into a single narrative rating derived from the decision matrix in Table 2. This rating is used as part of a weight of evidence evaluation of narrative aquatic life criteria.

For study sites that occur on or near the boundary of two bioregions, WSII and WYRIVPACS model scores for both bioregions are typically calculated. A scientifically defensible argument must then be used to determine whether one or both sets of model scores should be used to arrive at a final narrative rating.

**Table 2.** Aquatic life other than fish narrative category decision matrix. Results of the WSII and WYRIVPACS biological models are combined to derive a single narrative rating and then used in a weight-of-evidence approach to determine aquatic life other than fish designated use support.

		WYRIVPACS Narrative Category		
		Full Support	Indeterminate	Partial/Non-Support
WSII Narrative Category	Full Support	Meets Biological Expectations	Meets Biological Expectations	Indeterminate
	Indeterminate	Meets Biological Expectations	Indeterminate	Below Biological Expectations
	Partial/Non-Support	Indeterminate	Below Biological Expectations	Below Biological Expectations

In either case, both sets of model scores must be presented within the final report. Under no circumstances can model results and their narrative ratings be used interchangeably between bioregions

to arrive at a final narrative rating. For example, the WSII score from one bioregion cannot be paired with a WYRIVPACS score from a different bioregion.

Stream segments where the WSII and WYRIVPACS are not applicable can be sampled using a variety of alternative sampling methods. On perennial streams where riffles are common, macroinvertebrates can be collected using quantitative samplers (e.g., Surber, Hess or Slack Sampler). Due to the inherent spatial variability in their biological communities, there are segments of some streams where only semi-quantitative or qualitative macroinvertebrate sampling methods can be used. These segments include: non-wadeable perennial streams segments; ephemeral and intermittent stream segments; ditches; stream segments that have been changed from one type of stream (perennial, intermittent or ephemeral) to another; and reservoir tailwaters <1 mile below the dam. Multi-habitat sampling (WDEQ, 2016b) is a semi-quantitative method commonly used to sample macroinvertebrate communities in low gradient perennial or intermittent stream segments where riffles are limited or absent. It is imperative that each sampling method's limitations are known so that samples are collected appropriately and resulting data are scientifically defensible. A variety of habitats can be sampled using the methods described above. However, because riffle, run and pool communities naturally differ, it is important that the same habitat type be sampled when comparing communities between sites, so that taxonomic comparisons between sites are meaningful.

Analytical techniques to evaluate macroinvertebrate data collected using alternative quantitative, semi-quantitative methods may include but are not limited to: comparing communities between sites using select metrics (e.g., taxonomic diversity, relative abundance, % algae scrapers), other appropriate biological models, comparisons to findings from scientific literature, or various statistical methods. For macroinvertebrate data collected using only qualitative methods, analytical methods are limited to those that focus on taxonomic richness and presence/absence. Regardless of the analytical techniques used, it is critical that appropriate control and/or reference site(s) are sampled as part of the study to evaluate departure from biological expectations. Because the WSII and WYRIVPACS cannot be used to evaluate macroinvertebrate data collected with these alternative sample methods, several lines of biological evidence are required to evaluate narrative aquatic life criteria.

### ***Algae, Diatoms and Macrophytes***

WDEQ commonly collects periphyton (algae, diatoms, cyanobacteria, heterotrophic microbes, and detritus) samples in order to calculate algal and diatom community metrics and to estimate biomass and chlorophyll-a concentration. Estimates of biomass and chlorophyll-a between sites can be used to investigate nutrient enrichment. Algal and diatom community metrics are most often used to indicate changes in taxa between sites due to specific pollutants. For example, diatom community traits can be used to demonstrate increased tolerance for some stressors (e.g., depressed dissolved oxygen and elevated sediment and salinity) as compared to reference or control sites.

**Fully supporting** - Representative data show no exceedance of any numeric or narrative aquatic life criterion within at least 2 separate years of a 3-year period.

**Fully supporting, but threatened** - Representative data show no exceedances of any aquatic life criteria. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supporting** - Representative data indicate that at least one numeric or narrative aquatic life criterion is exceeded within at least 2 separate years of a 3-year period.

**Indeterminate** - Representative data, collected during a designated use support assessment, are either insufficient or inconclusive and designated use support cannot be determined.

**Not assessed** - Representative data are not available to determine designated use support.

## 4.4 Fish Consumption

Section 3(i) of Chapter 1 states that *the fish consumption use involves maintaining a level of water quality that will prevent any unpalatable flavor and/or accumulation of harmful substances in fish tissue.* As stated in Section 18 of Chapter 1, *in all Class 1, 2AB and 2A waters, the "Human Health Consumption of Fish and Drinking Water" values listed in Appendix B of these regulations shall not be exceeded. In all Class 2B, 2C and 2D waters, the "Human Health Consumption of Fish" (consumption of aquatic organisms) shall not be exceeded.* Narrative criteria for the fish consumption use can be found in Sections 13, 17, 18 and 22(c) of Chapter 1. Credible data are required when evaluating narrative criteria.

**Fully supporting** - Representative data show no exceedance of any fish consumption criteria within at least 2 separate years of any 3-year period.

**Fully supporting, but threatened** - Representative data show no exceedance of any fish consumption criteria. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supporting** - Representative data show that at least one fish consumption criterion is exceeded.

**Indeterminate** - Representative data, collected during a designated use support assessment, are either insufficient or inconclusive and designated use support cannot be determined.

**Not assessed** - Representative data are not available to determine designated use support.

## 4.5 Recreation

Section 3(e) of Chapter 1 states that the *recreational use protection involves maintaining a level of water quality which is safe for human contact. It does not guarantee the availability of water for any recreational purpose.* Wyoming's surface waters are designated for either primary or secondary contact recreational uses. Waters designated for secondary contact recreation through the use attainability analysis process outlined in Sections 33 and 34 of Chapter 1 are identified in the [Wyoming Surface Water Classification List](#) or the [Recreational Designated Uses Web Map](#). All other surface waters are designated for primary contact recreational use. Assessments of recreational designated use support in Wyoming are based on the numeric *E. coli* criteria found in Section 27 of Chapter 1. These criteria (Table 3) are intended to maintain a level of water quality that is safe for human contact by protecting humans from fecal associated pathogens, including bacteria, viruses and protozoa. Because *E. coli* concentrations can be highly variable, these criteria are based on a 60 day geometric mean of *E. coli* samples. In order to represent the entire 60-day period, WDEQ requires that a minimum of five samples be collected and that they be separated by a minimum of 10 days. However, WDEQ recommends collecting more than five samples when resources allow. When more than five samples are collected, samples within ten day periods must be averaged before being used to calculate the 60 day geometric mean.

The narrative criteria in Sections 13 and 28 of Chapter 1 can be used to evaluate the effects of harmful algal blooms on recreational uses. Credible data are required when determining designated use support using these narrative criteria.

**Fully Supported** – Representative data show no exceedance of the appropriate primary or secondary recreational use criterion.

**Fully supporting but threatened** - Representative data show no exceedance of the appropriate primary or secondary recreational use criterion. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supported** - Representative data show that the appropriate primary or secondary recreational use criterion is exceeded.

**Indeterminate** - Representative data, collected during a designated use support assessment, are either insufficient or inconclusive and designated use support cannot be determined.

**Not assessed** – Representative data are not available to determine designated use support.

**Table 3.** Table listing Wyoming’s *E. coli* criteria for primary and secondary recreational uses.

<b>Recreational Use Designation</b>	<b>Season</b>	<b><i>E. coli</i> Criteria</b>
Primary Contact	May 1 - September 30	Concentrations of <i>E. coli</i> bacteria shall not exceed a geometric mean of 126 organisms per 100 milliliters during any consecutive 60 day period.
Primary Contact	October 1 - April 30	Concentrations of <i>E. coli</i> bacteria shall not exceed a geometric mean of 630 organisms per 100 milliliters during any consecutive 60 day period.
Secondary Contact	All Year	Concentrations of <i>E. coli</i> bacteria shall not exceed a geometric mean of 630 organisms per 100 milliliters during any consecutive 60 day period.

Section 27(c) of Chapter 1 lists the single sample maximum *E. coli* concentrations that can be used to post recreational use advisories or to derive single-sample maxima on point source discharges. The single-sample maxima cannot be used to assess recreational designated use support; however, an exceedance of the single-sample maximum (235 organisms per 100 milliliters) for high use swimming areas during the summer recreational season (May 1 - September 30) may be used to post recreational use advisories. High use swimming areas include swimming beaches, public reservoirs and other popular recreational areas.

## 4.6 Wildlife

Section 3(h) of Chapter 1 states that *the wildlife use includes protection of water quality to a level which is safe for contact and consumption by avian and terrestrial wildlife species*. Narrative criteria for the wildlife use can be found in Sections 15, 16 and 22 of Chapter 1. WDEQ will evaluate credible data, including those related to wildlife illness, death, or deformity from wildlife agencies and utilize wildlife health information obtained from scientific literature when necessary and available. Unless data and/or information suggest otherwise, WDEQ will generally use aquatic life other than fish designated use support as a surrogate measure of wildlife designated use support. Credible data are required when evaluating narrative criteria.

**Fully supporting** - Representative data show no exceedance of any numeric or narrative aquatic life criterion and/or narrative wildlife criteria within at least 2 separate years of a 3-year period.

**Fully supporting, but threatened** - Representative data show no exceedance of any wildlife use criterion. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supporting** - Representative data show that at least one wildlife use criterion is exceeded within at least 2 separate years of a 3-year period.

**Indeterminate** - Representative data, collected during a designated use support assessment, show that an aquatic life other than fish use criterion is not supported, or are either insufficient or inconclusive and designated use support cannot be determined.

**Not assessed** - Representative data are not available to determine designated use support.

## 4.7 Agriculture

Section 3(a) of Chapter 1 states that *for purposes of water pollution control, agricultural uses include irrigation and/or livestock watering*. Section 20 states that *all Wyoming surface waters which have the natural water quality potential for use as an agricultural water supply shall be maintained at a quality which allows continued use of such waters for agricultural purposes. Degradation of such waters shall not be of such an extent to cause a measurable decrease in crop or livestock production*. Narrative criteria for the agricultural use can be found in Sections 15, 16, 20 and 22 of Chapter 1. Credible data relating to agricultural use or specific livestock and/or crop production are required when evaluating these criteria. Unless data and/or information suggest otherwise, WDEQ will generally use aquatic life other than fish designated use support as a surrogate measure of agricultural designated use support. Credible data are required when evaluating narrative criteria.

**Fully supporting** - Representative data show no exceedance of any numeric or narrative aquatic life other than fish criterion and/or narrative agricultural criterion within at least 2 separate years of a 3-year period.

**Fully supporting, but threatened** - Representative data show no exceedance of any agricultural use criterion. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supporting** - Representative data show that at least one agricultural use criterion is exceeded within at least 2 separate years of a 3-year period.

**Indeterminate** - Representative data, collected during a designated use support assessment, show that an aquatic life other than fish use criterion not supported, or are either insufficient or inconclusive and designated use support cannot be determined.

**Not Assessed** - Representative data are not available to determine designated use support.

## 4.8 Industry

Section 3(c) of Chapter 1 states that *industrial use protection involves maintaining a level of water quality useful for industrial purposes*. Section 19 states that *all Wyoming surface waters which have the natural water quality potential for use as an industrial water supply shall be maintained at a quality which allows continued use of such water for industrial purposes. Degradation of such waters shall not be of such an extent to cause a measurable increase in raw water treatment costs to the industrial user(s)*. Narrative criteria for the industrial use can be found in Sections 15, 16 and 19 of Chapter 1. Unless data and/or information suggest otherwise, WDEQ will generally use aquatic life other than fish designated use support as a surrogate measure of industrial designated use support. Credible data are required when evaluating narrative criteria.

**Fully supporting** - Representative data show no exceedance of any numeric or narrative aquatic life other than fish criterion and/or narrative industrial criterion within at least 2 separate years of a 3-year period.

**Fully supporting, but threatened** - Representative data show no exceedance of any industrial use criterion. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supporting** - Representative data show that at least one industrial use criterion is exceeded within at least 2 separate years of a 3-year period.

**Indeterminate** - Representative data, collected during a designated use support assessment, show that an aquatic life other than fish use criterion is not supported, or are either insufficient or inconclusive and designated use support cannot be determined.

**Not Assessed** - Representative data are not available to determine designated use support.

## 4.9 Scenic Value

Section 3(f) of Chapter 1 states that *scenic value use involves the aesthetics of the aquatic systems themselves (odor, color, taste, settleable solids, floating solids, suspended solids, and solid waste) and is not necessarily related to general landscape appearance.* Narrative criteria for the scenic value use can be found in Sections 15, 16 and 17 of Chapter 1; credible data are required when evaluating these criteria.

**Fully supporting** - Representative data show no exceedance of any scenic value criterion within at least 2 separate years of a 3-year period.

**Fully supporting, but threatened** - Representative data show no exceedance of any scenic value criterion. However, data indicate a declining water quality trend, that if continued, will likely result in a designated use support determination of not fully supporting.

**Not fully supporting** - Representative data show that at least one scenic value criterion is exceeded within at least 2 separate years of a 3-year period.

**Indeterminate** - Representative data, collected during a designated use support assessment are either insufficient or inconclusive and designated use support cannot be determined.

**Not assessed** - Representative data are not available to determine designated use support.

## 5. Categorization of Surface Waters

Once designated use support determinations are made by WDEQ, USEPA requires that all surface waters of the state be placed into one of five categories (USEPA 2005, 2006). Because designated uses, water quality standards and designated use support methodologies are not consistent across all states, tribes and territories, surface water categorizations are used to standardize these various approaches for USEPA's national reporting purposes. In Wyoming, designated use support determinations translate directly into the five categories below.

**Category 1** - Available data and/or information indicate that all designated uses are supported and no use is threatened.

**Category 2** - Available data and/or information indicate that at least one designated use is supported, while one or more other uses are either indeterminate or not assessed.

**Category 3** - Available data and/or information are either insufficient or inconclusive and designated use support cannot be determined for any uses.

**Category 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. There are two sub-categories of category 4:

- 4A.** A state developed TMDL has been approved by USEPA or a TMDL has been established by USEPA for any segment-pollutant combination.
- 4B.** Designated use support is expected to be restored in a reasonable period of time through other pollution control measures. For example, a stream that has been historically impaired by excess sedimentation from urban stormwater runoff may be moved to category 4B after stormceptors are installed that are expected to effectively trap the excess sediment before it reaches the stream. USEPA requires that states thoroughly demonstrate that an impaired water should be placed in category 4B rather than in category 5. All demonstrations must include: an identification of water and cause of impairment; a description of pollution control measures and how they are expected to result in standards attainment; an estimated timeline for standards attainment; a schedule for implementing and monitoring pollution controls; and a commitment to revise pollution controls as necessary.

**Category 5** - Available data and/or information indicate that at least one designated use is not being supported or is threatened because of a pollutant(s) and a TMDL is needed. Category 5 waters are placed on Wyoming's 303(d) List of impaired waters requiring TMDLs. Each pollutant/segment combination is considered a separate 303(d) Listing. For example, if the aquatic life other than fish use on a stream segment is impaired due to copper, sediment and selenium, these three pollutants would be considered three separate 303(d) Listings.

## **5.1 Determining Causes and Sources for 303(d) Listed Waters**

The pollutant(s) causing a criterion to be exceeded for each of Wyoming's 303(d) Listed waters is identified during water quality assessments using available data and/or information and a weight of evidence approach. Determining the cause(s) of impairment can be especially challenging when evaluating narrative criteria. As such, when evaluating narrative criteria, it is important that entities perform the necessary watershed reconnaissance during SAP development to strengthen study designs and evaluate as many suspected pollutants as is necessary and practical.

When the available data and/or information identify a pollutant's source(s), it is also added to the 303(d) List. Identifying point sources can usually be accomplished by comparing water quality data above and below an effluent outfall. Non-point sources, however, are typically diffuse and multiple sources can have an additive effect on water quality. In some cases, the source of a pollutant is unknown and therefore no source(s) are identified in the 303(d) List. WDEQ acknowledges that sources may exist which are beyond the scope of available data and/or information. Sources may be added or removed from existing 303(d) Listings as necessary as additional data and/or information become available.

## **5.2 Georeferencing Categorized Waters**

All categorized waters are georeferenced by WDEQ using GIS (Geographic Information Systems) and the U.S. Geological Survey (USGS) 1:24K NHD (National Hydrography Dataset) data layer. WDEQ typically delineates stream segments in one of two ways, depending on the number of study sites used in the assessment. If two or more study sites exist, the segment will usually be delineated to include the distance between the sites. If only one study site exists, however, the segment is usually extended from this site to the nearest upstream and downstream tributary. WDEQ recommends that data submissions include the necessary number of study sites to allow for an accurate delineation of each assessment.

A unique 305(b) identifier is assigned to each categorized water by WDEQ and serves as a permanent reference. Each identifier contains information about the state, river basin and 12-digit HUC (hydrologic unit code) containing the water and a sequence number indicating the order in which waters have been categorized within the 12-digit HUC. For example, a 36.5 mile segment of the Bear River, from the confluence with Woodruff Narrows Reservoir upstream to the confluence with Sulphur Creek was placed in category 5 and added to the 303(d) List in 2002. The 305(b) identifier for this segment is WYBR160101010303\_01, indicating that it is located in Wyoming (WY), in the Bear River Basin (BR), in 12 digit HUC 160101010303 and that this was the first (01) categorization decision by WDEQ within this 12 digit HUC.

Linear (streams) and polygon (lakes, reservoirs, ponds) shapefiles are updated every two years and submitted to USEPA along with the Integrated 305(b) and 303(d) Report. These shapefiles are available to the public for download on [WDEQ's Watershed Protection Program website](#). Lakes and reservoirs are typically placed into just one of the five categories, but can also be subdivided into several categories. In contrast, streams commonly have segments in more than one category.

### **5.3 USEPA's ATTAINS**

WDEQ uses USEPA's Assessment and Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS) to electronically submit Wyoming's Integrated 305(b) and 303(d) Report, water quality assessment decisions, attribute data and geospatial data representing the geographic locations of assessed waters.

## **6. Guidelines for De-listing Section 303(d) Listed Waters**

All non-supporting or threatened waters (Category 5) that are placed on Wyoming's 303(d) List of Impaired and Threatened Waters Requiring TMDLs have the potential to be removed from the 303(d) List (i.e., de-listed), by one of several means. The first is through the development of a TMDL (see Section 7 below TMDL prioritization), after which the water is moved from Category 5 to Category 4A. Secondly, de-listing can occur when a water is moved to Category 4B because the addition of pollution control measures are considered effective in remediating the cause of the impairment or threat. USEPA requires that states provide a thorough written demonstration (see Section 5.0 above) that an impaired water should be placed in category 4B rather than in category 5. A water can be de-listed if it can be demonstrated that the original data analysis or listing rationale were incorrect. A de-listing can also occur when a water is restored and the previously non-supported or threatened uses are determined to be supported. A de-listing can occur when a [Use Attainability Analysis \(UAA\)](#) removes a non-supported use from a water. Lastly, a water can be de-listed as the state's rules and standards are periodically revised and updated.

In an effort to protect public health, the data requirements for removing waters listed for exceeding recreational, drinking water and fish consumption use criteria are intended to be greater than those necessary to add a water to the 303(d) List. The data requirements for listing and delisting waters for pollutants on all other uses are equivalent. Below, for each designated use, WDEQ provides *general guidelines* for the data necessary to remove waters from the 303(d) List. These guidelines are intended to provide general goals or endpoints to those interested in watershed restoration. However, it is important to note that because each watershed and 303(d) Listing is unique, WDEQ *strongly* recommends consulting [Water Quality Assessment](#) personnel to discuss *specific* data requirements for each potential de-listing.

**Drinking water** - Representative data, collected for at least 2 consecutive years, show no exceedance of the numeric criteria in Appendix B (listed under "Human Health Value Fish & Drinking Water"),

Sections 22 and 23 and/or narrative criteria in Sections 13, 14, 15, 16, 17 and 29 of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing.

**Fisheries** - Representative data, collected for at least 2 consecutive years, show no exceedance of the numeric criteria listed in Sections 21, 23, 24, 25, 26 and Appendices B, C and D and narrative criteria in Sections 12, 13, 15, 16, 22, 28, 29 and 32 of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing. If the water was originally listed by default because the aquatic life other than fish use was not fully supported, data spanning at least two consecutive years must demonstrate that the aquatic life other than fish use is now fully supported.

**Aquatic life other than fish** - Representative data, collected for at least 2 consecutive years, show no exceedance of the numeric criteria in Sections 21, 25, 26 and Appendices B (listed under "aquatic life acute values and aquatic life chronic values") and C and the narrative criteria in Sections 12, 13, 15, 16, 22, 25, 28, 29 and 32 of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing.

**Fish consumption** - Representative data, collected for at least 2 consecutive years, show no exceedance of the numeric criteria listed in Appendix B (listed under "Human Health Value Fish & Drinking Water" or "Human Health Value Fish Only") or the narrative criteria found in Sections 13, 17 and 22(c) of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing.

**Recreation** - Representative data, collected for at least 2 consecutive years, show no exceedance of the criteria described in Sections 13, 27 and/or 28 of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing.

**Wildlife** - Representative data, collected for at least two consecutive years, show no exceedance of any wildlife narrative criteria in Sections 15, 16 and 22 of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing.

**Agriculture** - Representative data, collected for at least two consecutive years, show no exceedance of any agricultural narrative criteria in Sections 15, 16, 20 and 22 of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing.

**Industry** - Representative data, collected for at least two consecutive years, show no exceedance of any industrial narrative criteria in sections 15, 16 and 19 of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing.

**Scenic value** - Representative data collected for at least two consecutive years show no exceedance of the narrative criteria in Sections 15, 16 and 17 of Chapter 1 of the Wyoming Water Quality Rules and Regulations for the pollutant associated with the listing

## 7. References

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- WDEQ, 2016b. [Manual of Standard Operating Procedures for Sample Collection and Analysis](#). Wyoming Department of Environmental Quality, Water Quality Division, Cheyenne, WY – June, 2016.

## Appendix A

### WDEQ's Criteria for Reviewing Water Quality Data Used in Designated Use Support Determinations

WDEQ will use the following criteria to review all water quality data submitted to and generated by the Watershed Protection Program for designated use support determinations. Data reviews will be conducted by the Watershed Protection Program's Quality Assurance/Quality Control (QA/QC) Officer. Data submissions determined by the QA/QC Officer to satisfy these criteria will be further evaluated by the Water Quality Assessment Program toward designated use support determinations and may be included in the subsequent Integrated Report. Data submissions that do not satisfy these criteria will not be used for making designated use support determinations, but may be described in the Integrated Report. If data do not satisfy these criteria, the QA/QC Officer will provide a detailed explanation of data deficiencies to the monitoring entity. If these deficiencies are adequately addressed, data may be re-submitted to WDEQ's QA/QC Program for additional review.

#### A. Completeness Items.

1. Restatement of objectives – are they the same as in the SAP?
2. Narrative of actual activities completed – are they the same as in the SAP?
3. Are all the raw data contained in the package?
  - a. Complete data forms.
  - b. Complete laboratory data sheets.
4. Are field notes included in the package? Do they contain consistent and sufficient information on items a-f below?
  - a. Name of samplers
  - b. Date and time of sampling.
  - c. Weather conditions.
  - d. General observations of environment.
  - e. Notes on working condition of equipment.
  - f. Notes and justification on the need to modify any aspect of the SAP or a specific Standard Operating Procedure.
5. Are other items outlined in the SAP (GPS readings, site photographs, model results, etc.) present in the package?
6. Did monitoring entity have permission to sample at sites on National Park Service, State, or private lands? Did entity have permission to access all sample sites?
7. Are all QC items present?
  - a. Chain of Custody information.
  - b. QA/QC report.<sup>1</sup>
  - c. Blank, duplicate, and spike data.
  - d. Field Instrument information;
    - i. Description of instruments used.
    - ii. Meter calibration logs.
8. Summary and conclusions section.

#### B. Review of Project Quality Assurance

1. Did the samplers identified as being trained and qualified in the SAP conduct the monitoring?
2. Did the data interpreters identified as being trained and qualified in the SAP conduct the data interpretation?
3. If a field audit was conducted, results are included in the package?<sup>2</sup>
4. Same analytical procedures used, or if different procedures used, similar accuracy and precision as outlined in the SAP?
5. Same sample design used as outlined in SAP?

6. Review of data quality objectives and reconciliation of data quality objectives.
- C. Review of Data Quality Control<sup>3,4</sup>
1. Were all holding times met?
  2. Was proper sample preservation used?
  3. Were proper sample containers used?
  4. Was control of the sample maintained (chain of custody)?
  5. Was the number of blanks adequate (as outlined in the SAP)?
  6. Did any of the blanks indicate some type of contamination?
  7. Was the number of duplicates adequate (as outlined in the SAP)?
  8. Did any of the duplicates indicate variability outside of the acceptable limits contained in the SAP or QAPP?
  9. Was the number of spikes adequate (as outlined in the SAP)?
  10. Did any of the spikes indicate variability outside of the acceptable limits contained in the SAP or QAPP?
- D. Review of Data Representativeness
1. Spatial Evaluation. Do the exact sample locations match the goals and design of the study and justify the interpretation of the results?
  2. Temporal Evaluation. Did the sample times (day, hydrograph, or season) match the goals and design of the study and justify the interpretation of the results?
  3. Geophysical Evaluation. Were the samples collected in the proper location in the water body in order to match the goals and design of the study and justify the interpretation of the results?
  4. Data Interrelationships. Do different pieces of data correlate to one another as would be expected?
  5. Evaluation of the data with historic or expected data. Do individual pieces of datum simply not fit into the range of expected values for that system?
  6. Evaluation of data evenness. Are the individual data points over-represented by samples collected under certain environmental factors (high flows, wet weather conditions, base flow, etc.) that could skew data summary?
- E. Review of Data Quantity
1. Are all data reported and are all qualified data clearly identified?
  2. Does the report provide validated data that DEQ could use for use support determination?
  3. Use Support - Numeric Criteria.
    - a. Per the study design established in the SAP, are there adequate samples to characterize an acute or chronic condition?
    - b. For E. coli monitoring, are there adequate samples to characterize a 60-day exposure period for contact recreation?
    - c. If supporting data are required for evaluation against numeric criteria (i.e., temperature and pH data for an ammonia determination or hardness data for certain metals determinations) is that data provided?
    - d. Per the study design established in the SAP, if supporting information and a weight of evidence approach is needed to make a use support determination for a numeric criteria (e.g., temperature, DO, pH), that information is provided?
  4. Use Support - Narrative Criteria<sup>5</sup>.
    - a. Are there adequate physical, chemical, and biological data as outlined in the SAP?

- b. Are there adequate supporting information (consideration of soil, geology, hydrology, geomorphology, climate, stream succession, and the influences of man) utilized and discussed?
- c. Were all the data and supporting information used in a weight-of-evidence approach?

<sup>1</sup> The monitoring entity may elect to have an independent party complete a project QA/QC report. In these instances, the QA/QC officer will review that report for concurrence or modification. If the monitoring entity does not elect to have the independent QA/QC report done, the DEQ QA/QC Officer will conduct this review and report.

<sup>2</sup> Monitoring entities are not required to have an audit, but if an audit is conducted, the results of that audit must be submitted to the WDEQ as part of the data submission and will be considered during the QA/QC review. Audits of non-WDEQ entities should, at a minimum, contain comparable information to that used by WDEQ in order to be considered a complete audit by the WDEQ for QA/QC purposes. These items include:

- Did sampler take consistent and sufficient field notes? Were Chain of Custody procedures followed and documented?
- Were sufficient blanks, duplicates, and spikes obtained, per the SAP?
- Were calibration standards current?
- Were proper equipment calibration procedures used?
- Were calibration logs current?
- Did the samplers identified as being trained and qualified in the SAP conduct the monitoring?
- Were all holding times met?
- Was proper sample preservation used?
- Were proper sample containers used?
- Were containers rinsed before filling, if no preservative was present?
- Were samples cooled appropriately?
- Did sampler complete activities appropriately, for:
  - Field parameter collection?
  - Chemical water sample collection?
  - *E. coli* sample collection?
  - Macroinvertebrate sample collection?
  - Periphyton sample collection?
  - Discharge measurements?
  - Cross-section survey?
  - Other physical measurements?
- Were any modifications to the SAP noted?

The audit should include any additional comments on noteworthy items not included above, a summary and conclusions section, and any recommendations based on findings of the audit.

The audit form should be signed and dated by the entity conducting the audit. The monitoring entity must be available for a field audit conducted by the WDEQ if the WDEQ requests to conduct an audit. Suitable notice and mutually agreeable arrangements will be made if such an audit is scheduled. A monitoring entity may elect to have an independent party complete a field audit. The qualifications of the independent auditor should be consistent with the training and experience required of an individual sampler. In instances where an audit is conducted by an independent party, the QA/QC Officer will review the field audit report provided for additional insight or information pertinent to the QA/QC data review.

<sup>3</sup> All data not meeting data quality objectives must be qualified as such. Usability of those data must be clearly explained and adequately justified.

<sup>4</sup> Several monitoring protocols for numeric criteria constituents are done entirely (sample collection, sample processing, and sample analysis) by a single individual. Examples are: temperature, pH, dissolved oxygen, turbidity, and *E. coli* bacteria. QC measures that may help validate data for these parameters include: independent field audits, side-by-side independent inter-crew sampling with separate instruments, duplicate samples sent to independent laboratory, correlation of results with other QA/QC'd data sets; and/or correlation with other independent monitoring data collected in the watershed. Monitoring entities should consider whether such QC measures are necessary to meet study objectives.

<sup>5</sup> If the monitoring is to evaluate use support based on a narrative criteria, supporting information required by "Credible Data" regulations (soils, geology, hydrology, geomorphology, climate, stream succession, and the influences of man) must be presented in the final report.