UTAH'S 303(D) ASSESSMENT METHODOLOGY

2016 Integrated Report

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Acknowledgements

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Acronyms

AU	Assessment Unit
BPJ	Best Professional Judgment
CWA	Clean Water Act
DWQ	Division of Water Quality
EPA	U.S. Environmental Protection Agency
GIS	Geographic Information System
GSL	Great Salt Lake
IR	Integrated Report
QAQC	Quality Assurance Quality Control
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
UAA	Use Attainability Analysis
WLA	Waste Load Allocation
WMU	Watershed Management Unit

CONTENTS

EXECUTIVE SUMMARY

Changes from Previous Methodology

The following assessment methodology summarizes the methods that DWQ follows when assessing whether water quality is sufficient to support the designated uses assigned to Utah's surface waters. Central to this methodology is the complete documentation of assumptions and decisions made by DWQ in evaluating water quality data and supporting information. This document represents a thorough revision of the assessment methods and presents greater detail and clarification of assessment procedures taken in creating the Integrated Report. Some of the major revisions include the following:

- DWQ has adopted a six year period of record for evaluating water quality data. This change is intended to better align with the six year rotating basin approach adopted by the Monitoring Program.
- The methods include a draft proposed approach to assessing high-frequency data collected on the Jordan River. Assessments for dissolved oxygen at several long-term data collection sites will be performed to determine both the appropriate interpretation of water quality standards and the status of Jordan River oxygen impairments.
- In an effort to expand the use of other sources of water quality data, DWQ developed associated credible data criteria for integrating data in the IR.
- The methods include greater detail and clarity on listing and de-listing procedures for the categorization of assessment units and generating the final 303(d) list.

HOW TO USE THIS DOCUMENT

Utah's 303(d) Assessment Methodology provides a framework for categorizing and determining whether a waterbody or segment within a waterbody supports or does not support the assigned water quality standards and designated uses found in UAC R317-2. However, there may be site-specific considerations not identified in the 303(d) Assessment Methodology that are appropriately factored into the final listing decision.

Generally, DWQ's recommendation to list or not list a waterbody will be based upon the stringent application of the policies and procedures outlined in the data assessment sections of this document. As is also indicated in this document, best professional judgment (BPJ) may be applied when necessary. If BPJ or any other deviations from the methodology defined in this document are implemented, DWQ will track these deviations and provide justification and supporting documentation, if needed.

All changes and supporting information will be available to stakeholders and other interested parties for their review during the Integrated Report (IR) and 303(d) public comment periods. DWQ will encourage stakeholders and other reviewers to submit their own BPJ and mitigating evidence using the data and information requirements outlined in this methodology and the Integrated Report Call for Data. All DWQ and stakeholder-generated data and information will be retained by DWQ and become part of the process for final consideration and approval of the IR and 303(d) List.

INTRODUCTION

The Clean Water Act and the Integrated Report

Clean Water Act (CWA) federal rules and regulations require the Utah Division of Water Quality (DWQ) to report the condition or health of all surface waters to Congress every other year. This Integrated Report (IR) contains two key reporting elements defined by the CWA:

- Statewide reporting under Section 305(b)
  Section 305(b) reporting summarizes the overall condition of Utah's surface waters and estimates the relative importance of key water quality concerns. These concerns can include pollutants, habitat alteration, and sources of water quality problems.

- Water quality assessments under Section 303(d)
  Section 303(d) requires states to identify waters that are not attaining beneficial uses according to state water quality standards (**UAC R317.2.7.1**). The Utah Section 303(d) List also prioritizes the Total Maximum Daily Loads (TMDL) required for each listed waterbody and the cause of nonattainment. This list includes waters impaired as a result of nonpoint sources, point source discharges, natural sources, or a combination of sources.

In addition to Utah's Section 303(d) List, DWQ also identifies waterbodies in the IR that DWQ suspects have water quality problems but cannot confirm due to uncertainty regarding the nature of the data, insufficient sample size, or other factors. Waterbodies without sufficient information to make an assessment determination are given priority by the Assessment Program for follow-up monitoring to determine whether the waterbody is attaining water quality standards.

Waters that are not on the Section 303(d) List or the Assessment Program's priority list for follow-up monitoring are either currently addressed by DWQ through a TMDL or other pollution control mechanism or are attaining water quality standards. Full descriptions of these and other EPA- and state-identified waterbody assessment classifications are described in the following section.

Assessment Categories for Surface Waters

DWQ used the following five categories defined by EPA to assess surface waters of the state (EPA 2002). DWQ has also developed several state-derived subcategories that are used for internal tracking and planning purposes in addition to EPA's categories. All categories and subcategories are described in Table 1.

Table1. EPA and DWQ Categorization of Assessed Surface Waterbodies for Integrated Report (IR) Purposes

Category	Sub-category	Category Description
1	n/a	Supporting All beneficial uses assigned to a waterbody are evaluated against one or more numeric criteria *and* each use is found to be fully attaining applicable water quality standards.
2	n/a	No Evidence of Impairment Some, but not all, designated uses are evaluated against one or more criterion. Uses that are assessed are found to be (1) attaining but insufficient in size because some data was rejected by a use due to quality concerns, (2) attaining but insufficient in size with no exceedances because some data was rejected by a use due to quality concerns, or (3) attaining but insufficient in size with no exceedances.
3	3A	Insufficient Data, Exceedances There are insufficient data and information to conclude support or nonsupport of a use, but the smaller dataset had water-quality criteria exceedances. This category is also used where a best professional judgment (BPJ) was applied to a waterbody that was not attaining, but questions exist as to whether the standard violations were the result of atypical, rather than representative, conditions. In the latter case, DWQ requires that conformational data are collected before listing the waterbody as impaired in a future IR cycle. These waterbodies are prioritized for follow-up monitoring by the Assessment Program.
3	3B	Confirmation Data Required Lakes and reservoirs where there are insufficient data and information to conclude support or nonsupport of a use, but the dataset had water-quality criteria exceedances.
3	3C	Assessment Methods in Development This category is currently used for Great Salt Lake (GSL) (Class 5). Assessment of the designated uses of this ecosystem is complicated because, with the exception of a selenium standard applicable to bird eggs, GSL lacks numeric criteria. Also, the lake is naturally hypersaline, so traditional assessment methods are not appropriate. DWQ is working toward developing both numeric criteria and assessment methods for this ecosystem as outlined in the Great Salt Lake Water Quality Strategy In the interim, the IR documents the progress that was made in the most recent two-year reporting cycle.

3	3D	Further Investigations Needed Waterbodies that are assessed against water quality parameters/characteristics and require further investigations as defined in UAC R317-2 or are currently undergoing standards development, numeric criteria revisions, or assessment methodology development. These waterbodies are prioritized for follow-up monitoring by the Standards Program.
3	3E	Insufficient Data, No Exceedances Insufficient data and information to make an assessment, but the smaller dataset had no water-quality criteria exceedances. These waterbodies are prioritized for follow-up monitoring by the Assessment Program at a lower priority than 3A and 3F.
3	3F	Not Assessed Waterbodies not assessed because there was no data available to perform an assessment. In cases where no recent data is available, historic-listing determinations will be maintained as outlined in later sections of this document. These waterbodies are prioritized for follow-up monitoring by the Assessment Program at a lower priority than 3A.
4	4A	TMDL-Approved Waterbodies that are impaired by a pollutant and TMDL(s) have been developed and approved by EPA. Where more than one pollutant is associated with the impairment of a waterbody, the waterbody and the parameters that have an approved TMDL are listed in this category. If a waterbody has other pollutants that need a TMDL, the waterbody is also listed in Category 5. Therefore, an assessment unit (AU) can be listed in Category 4A and 5.
4	4B	Pollution Control Consistent with 40 CFR 130.7(b)(l) (ii) and (iii), waterbodies that are not supporting designated uses are listed in this subcategory where other pollution control requirements such as best management practices required by local, state, or federal authority are stringent enough to bring the waters listed in this category back into attainmentin the near future with the approved pollution control requirements in place. All waterbodies placed in this category must have a Pollution Control Requirement Plan developed and approved by EPA. Similar to Category 4A, if the waterbody has other pollutants that need a TMDL, or there is already a TMDL in place for another pollutant, the waterbody may also be listed in Category 5

		and 4A. Therefore, an AU with a pollution control in place can be listed in Category 4B, 4A, and 5.
4	4C	Non-Pollutant Impairment Waterbodies that are not supporting designated uses are placed in this category if the impairment is not caused by a pollutant but rather by pollution such as hydrologic modification or habitat degradation. Similar to Category 4A and 4B, if the waterbody has other pollutants that need a TMDL, or there is an approved TMDL or pollution control mechanism in place, the waterbody may also be listed in Category 4A, 4B, and 5. Therefore, an AU with a pollution control in place can be listed in Categories 4C, 4B, 4A, and 5. Historic listings of these waterbodies and causes of impairment are identified in the IR as Utah's Section 303(d) list. However, DWQ is not placing new waterbodies into this category until a listing methodology is developed.
5	*5*	Not Supporting The concentration of a pollutant, or several pollutants, exceeds numeric water quality criteria, or quantitative biological assessments indicate that the biological designated uses are not supported. The latter determination is based on violation of the narrative water quality standard. These impaired waters constitute Utah's formal Section 303(d) list.

Utah's Numeric Criteria and Beneficial Uses

To determine the appropriate assessment categories for a waterbody (Table ?.), DWQ must first evaluate the impact of measured pollutant concentrations on environmental and human health effects. Under UAC R317-2, Utah has developed and adopted over 190 water quality numeric criteria (chemical concentrations that should not be exceeded) to protect the water quality of surface waters and the uses these waterbodies support. As noted in UAC R317-2, the water quality criteria for a pollutant can vary depending on the beneficial use assigned to a waterbody.

To identify the use and value of the waterbody for public water supply, aquatic wildlife, recreation, agriculture, industrial, and navigational purposes, EPA and DWQ developed several beneficial uses classifications (see UAC R317-2-6). Currently, DWQ uses four major categories to characterize the uses of surface waters within the state for 303(d) assessment purposes:

- Domestic Water Systems
- Recreational Use and Aesthetics
- Aquatic Wildlife
- Agricultural

The Great Salt Lake has its own beneficial use classification (Class 5). Sub-classifications of these categories also exist and are further defined in Table 2.

For 303(d) assessment purposes, every beneficial use with numeric criteria and credible data is assessed and reported. DWQ does not just assess and report on the most environmentally protective criterion and/or use for a parameter and waterbody. Where waterbodies are unclassified and do not have assigned beneficial uses in DWQ data records, DWQ will assign default beneficial uses as articulated in UAC R317-2-13.9, 13.10, 13.11, 13.12, and 13.13.

For more information on how DWQ develops, adopts, and updates the numeric criteria and beneficial uses in UAC R317-2, please refer to DWQ's Standards web page.

Table 2. Subclassifications of Utah's Beneficial Uses

Beneficial Use Classification	Use Definition
1C*	Drinking Water
2A	Primary Contact Recreation
2B	Secondary Contact Recreation
3A*	Coldwater Aquatic Life
3B*	Warm Water Aquatic Life
3C*	Nongame Aquatic Life
3D*	Wildlife

4	Agriculture
5	Great Salt Lake

* There are human health criteria associated with these beneficial uses in UAC R317-2. For uses with a human health (HH) criteria associated to them (see Table 2..14.6 in UAC R317-2), the following use notation will be used in 303(d) data and assessment reports: HH1C, HH3A, HH3B, HH3C, and HH3D.

Priority and Assessed Parameters

To make the list of pollutants with numeric criteria in UAC R317-2 more manageable for monitoring for assessment purposes, DWQ developed a priority-parameter list that is used in routine water quality monitoring. This priority list is a subset of the pollutants listed in UAC R317-2 and reflects the following constraints:

- Laboratory resources limit DWQ's ability to assess all parameters in UAC R317-2.
- Monitoring and/or analysis costs associated with processing a sample or measuring a pollutant are significant.
- The location of DWQ's sampling efforts between reporting cycles may make it difficult to measure a parameter in UAC R317-2 in the waterbodies targeted by DWQ during a given monitoring season.

As a result, water-quality assessments may not report on all parameters listed in UAC R317-2. Instead, assessments reflect all parameters with adopted numeric criteria that also have readily available and credible datasets from the two IR periods of record against which they can be evaluated.

To view DWQ's list of priority parameters, please refer to the Parameters Currently Assessed table located on the **Integrated Report Call for Data**. Please be aware that priority parameters can change from one reporting cycle to the next if lab and financial constraints and monitoring priorities within a sampling area change. More information on how DWQ identifies a priority parameter can be found in DWQ's **Strategic Monitoring and Targeted/Annual Monitoring Plans**.

ASSESSMENT PROCESS

Existing and Readily Available Data

To determine whether a waterbody is supporting or not supporting the assigned beneficial uses and numeric criteria in UAC R317-2, DWQ must compile all existing and readily available data. As part of the initial data compilation process, DWQ will take into account and consider the following parameters:

- Data and information referenced in 40 CFR §130.7(b)(5)(i), (iii) and (iv), which defines readily available data for inclusion in water quality assessments. In addition to DWQ data collected for assessment purposes, DWQ also uses the raw data collected for other DWQ programs, such as waste load allocations (WLA), TMDL development, watershed, and use attainability analysis (UAA))
- Credible data and information that are submitted to or obtained by DWQ during the IR public call for data from October 1 – December 31 of odd-numbered years
- Data and information that is independently collected by DWQ and its cooperators between reporting cycles

- Quantitative data that can be downloaded from publicly available databases from federal, state, and local agencies
- Additional sources of data included in the Data Types Matrix of the Integrated Report Call for Data

Existing data that is not brought forward through one the above mechanisms or otherwise presented to DWQ in accordance with the schedule as outlined in this document and on the assessment website will not be treated as "readily available" for the purpose of assessment decisions during the current assessment cycle. Instead, this information will be considered in the next assessment cycle.

Any data that is available and submitted to DWQ or obtained by DWQ during the IR data compilation process is subject to DWQ's data management and QA/QC processes. Depending on resource limitations and level of effort required to ensure compatibility of the data with DWQ's dataset, some data may be excluded from formal assessment calculations, although such data may still be used as supporting evidence for assessment decisions. To help ensure the inclusion of data in DWQ's assessment process, it is important for data to be submitted in a form that matches DWQ's existing data-management capabilities. Required formats and meta-data submissions are provided on the **Integrated Report Call for Data** website and will be updated October 1st of odd numbered years.

Should data not be included in the assessment process because of resource or other limitations, DWQ will clearly define in the draft and final IR which dataset(s) could not be included, why, and next steps DWQ will take to ensure future inclusion of these datasets and information. Updates on datasets that will be targeted by DWQ for the upcoming assessment cycle will be provided on **Integrated Report Call for Data** web page.

Developing the Methodology

This document describes Utah's most current assessment methods that will be applied for Utah's 2016 Integrated Report (IR). While many of the methods described have been applied in past assessment cycles, other methods are new or modified from previous cycles. Some of the assessment method revisions are simply intended to clarify ongoing DWQ practices. Other more substantive revisions to the methodology are based on concerns that were raised during the public comment periods of the 2014 303(d) assessment methodology and draft IR and 303(d) List.

DWQ updates and revises the 303(d) methodology when concerns are raised and/or program developments are released by DWQ's Assessment, Monitoring, Standards, and Watershed Protection programs. Additional modifications or clarifications to the assessment methodology may also be made based on feedback provided by EPA during and after a reporting cycle or from the Agency's cycle-specific 303(d) guidance memo released to states on odd-numbered years.

Moving forward, all changes made to the 303(d) assessment methodology will be reviewed and updated on odd-numbered years in anticipation of developing the IR and 303(d) List in even years. This process allows DWQ to consider comments and suggestions on assessment methods before a formal analysis is conducted and reduces the need to rework analyses due to changes in methodology.

Public Review of the Methodology

The process for formal consideration and acceptance of the Assessment Methodology is driven by a public review process that follows the following schedule:

1. DWQ releases the proposed methodology on March 11, 2015, for a 30-day public comment period. The notice for public comments on the methodology is advertised, at a minimum, in the Salt Lake

Tribune, Desert News, DWQ's News and Announcements and/or Public Notices, the Integrated Report Call for Data website, and DWQ's listserv.

2. At the close of the public comment period on April 12, 2015, DWQ compiles and begins responding to comments that were received within the 30-day public comment period.
3. If substantial revisions to the methodology are adopted by DWQ based on comments received in the first public comment period, DWQ has the discretion to hold a second public comment period of 30-days or less Should DWQ proceed with a second public comment period, notifications will be advertised, at a minimum, on DWQ's News and Announcements and/or Public Notices, the Assessment website, and DWQ's listserv.
4. Following the conclusion of the public comment period(s), DWQ will release a final version of the methodology that will be used in the upcoming assessment cycle. DWQ's response to comments will be Included in the final version of the Assessment Methodology.
5. After the release of the final 303(d) assessment methodology, any concerns or rebuttals will not be considered for the analysis of the upcoming IR. If stakeholders continue to have concerns with the final assessment methodology, the public should submit their comments during future calls for public comments on 303(d) assessment methodologies that support future IR cycles.

Concerns and comments not received through the above processes cannot be guaranteed inclusion in current and future 303(d) methodology updates and modifications. However, in the event that additional changes or additions to the publicly vetted 303(d) assessment methodology are made following the close of the public comment and during the current assessment process, those 303(d) methodology alterations will be documented and issued with the draft IR and 303(d) for additional public comment.

Developing the Components of the IR and 303(d) List

Following the release of a final 303(d) Assessment Methodology and compilation of all existing and readily available data, DWQ reviews all data and assigns a credible data "grade" as defined on the Integrated Report Call for Data website. All non-rejected, credible data is then assessed as defined in this document for the release of the following IR and associated 303(d) components.

Executive Summary

This component will include but not be limited to:

- Percent of waters assessed versus not assessed
    - Of those waters that were assessed, the percent that are impaired versus not impaired
    - Of those waters that were impaired, the percent that have approved TMDLs versus those that do not have approved TMDLs
- Percent of impaired versus not-impaired waters by beneficial uses
- Miles/acres and number of waterbodies that are impaired for a specific cause
- Update on the miles/acres of causes of impairments
- Number of attaining/supporting waters
- Number of approved TMDLs by pollutant and the number of causes addressed in the TMDL

305(b) Summary of Lakes/Reservoirs and Rivers/Streams

At a minimum, this summary will address the following elements:

- Percentage of rivers, streams and lakes that are categorized as "good", "fair", and "poor" physical and chemical condition
- Biological condition of these waterbodies using direct measures of aquatic life

- Ranking of the relative importance of chemical and physical stressors impacting aquatic life

303(d) Assessment Results

At a minimum the following information will be provided:

- 303(d) list and other EPA- and state-derived assessment categories by waterbody type. The two lists include the following information:
    - Monitoring Site IDs and names of the waterbodies
    - EPA- and state-defined assessment category
    - Waterbody type
    - Waterbody size
    - Causes of impairment(s), if known
    - Cycle first listed and the last cycle the waterbody and cause of impairment were assessed
    - Impaired uses, if any
    - TMDL Priority for Category 5 waters and previous listing decisions (when new data doesn't result in de-listing and an update to an assessment category, or no new data existed and the assessment category from prior 303(d) listing is applied)
- De-listings by waterbody and parameter
- Status update on approved TMDLs

303(d) Assessment Meta-data

For archiving purposes and to assist with the review of the IR and 303(d) List, DWQ will also provide:

- Data reports and summaries of the assessment results by parameter
- Geo-location information on waterbodies that were assessed
- The date and version of UAC R317-2 that was used in the assessment cycle

Note: On January 1st of odd-numbered years, DWQ will "freeze" and establish file versions of several working files to maintain consistency and data integrity. These files include, but are not limited to, GIS point files of monitoring locations, layers of AUs, beneficial uses, and water quality standards.

Surface Water Program Updates on Wetlands and the Great Salt Lake

In addition to the above elements, the IR will include individual chapters of the Great Salt Lake and the Wetlands Assessment Program. Both will highlight the most recent program updates and evaluation of recent data and information.

Public Review of the 303(d) List

Similar to the consideration and final adoption of the 303(d) Assessment Methodology, there will be a formal public review process for the IR and 303(d) List with the following steps:

1. Any person who has a pollution-control mechanism plan and would like to submit that plan for consideration and EPA approval as a 4B category must submit that information to DWQ by July 1 of odd-numbered years (4B Appendix). If approved by DWQ, this information will then be submitted to EPA for review and final approval. It should be noted, however, that successful Category 4B determinations typically take a long time to receive EPA approval and would likely not be received in time to be included in the current IR cycle.
2. Waters and pollutants that are considered for a potential 4A category (approved TMDLs) must be approved by DWQ's Water Quality Board per UAC R317-1-7) and EPA per 40 CFR 130.7 by

September 30 of odd-numbered years. TMDLs that are approved by DWQ and EPA after that date will be considered in future IRs.

3. After October 1 of odd-numbered years and no later than February 1 of even-numbered years, DWQ will release the proposed IR and 303(d) List for a 30-day public comment period. At a minimum, the notice for public comments on the IR will be advertised in the Salt Lake Tribune, Desert News, DWQ's **News and Announcements and/or Public Notices,** the **Assessment** website, and DWQ's listserv.
4. Stakeholders who wish to submit data for listing or de-listings considerations are encouraged to submit that data and information during the assessment program's Call for Data. However, DWQ will also consider data that is submitted during the public comment period of the draft IR and 303(d) List when the public commenter can show that their submitted data results could result in a potential change to a specific waterbody-assessment decision Data that is submitted during the public comment period for the draft IR must be submitted in the format articulated in this document and on the Integrated Report Call for Data website and be of Grade A or B quality to be used in an assessment decision (see **Data Quality Matrices, Integrated Report Call for Data**).
5. During the 30-day public comment period for the draft IR and 303(d) List, the Assessment Program will present a summary of the draft report and 303(d) List to DWQ's Water Quality Board. Concerns raised by the Board will be documented and considered part of the public comment process.
6. At the close of the 30-day public comment period, DWQ will compile and begin responding to comments that were received within the 30-day public comment period.
7. If substantial revisions to the IR and 303(d) List are adopted by DWQ on the basis of comments received in the first public-comment period, DWQ may grant or withhold its discretion to offer a second public comment period of 30-days or less. Should DWQ proceed with a second public comment period, notifications will be advertised, at a minimum, on DWQ's News and Announcements and/or Public Notices, the Assessment website, and DWQ's listserv.
8. No later than April 1 of even-numbered years, DWQ will submit a response to the public comments that were received during the 30-day public comment period and a final version of the IR and 303(d) List to EPA for final approval. DWQ will post a status update on the Integrated Report website, letting stakeholders know that a final IR was submitted to EPA for final approval. After the submission of the IR to EPA for final approval, any concerns or rebuttals that stakeholders have with the IR will not be considered for the recently submitted IR. If stakeholders continue to have concerns with the IR and 303(d) List, they should submit their comments through future calls for public comments on future IRs.
9. EPA has 30 days to approve or disapprove the 303(d) lists after receiving DWQ's formal submission letter, IR Chapters, 303(d) List, categorization of non-303(d) waterbodies, public comment received and DWQ's response to them, de-listing tables and justifications, list of approved TMDLs/Pollution Control Mechanisms, and shapefiles of all assessment results. If EPA disapproves a state list, EPA has 30 days to develop a new list for the state, although historically EPA has rarely established an entire list for a state. EPA may also partially disapprove a list because some waters have been omitted, and EPA may add these waters to the state's list. If EPA's final approval of the IR takes longer than the timeframe identified above, DWQ will post updates on the Integrated Report website.
10. Any concerns and comments not received through the above processes cannot be guaranteed for inclusion in the IR. DWQ will apply discretion with regards to evaluating and responding to comments received after the ending of the comment period.

Finalizing the 303(d) List

Following EPA's approval, DWQ will release the following information on DWQ's Assessment Program website:

- Draft and final versions of 303(d) Assessment Methodology, including the public comments received and DWQ's response to comments
- Draft and final IR Chapters and 303(d) Lists, including public comments received, DWQ's response to comments, all assessment information that was considered and evaluated in the finalization of the IR and 303(d) List, and a Geographic Information System (GIS) file of the final assessments and 303(d) List

In addition, EPA maintains a **database** of state IR results and TMDL status. If additional information not available on the Assessment website is needed, DWQ may require a **Government Records Access and Management Act (GRAMA) request** to be filed. These requests can be submitted at any time.

SCOPE OF THE ASSESSMENT

Waters of the State

As defined in **UAC R317-1-1**, DWQ characterizes waters of the state as:

> "… all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, which are contained within, flow through, or border upon this state or any portion thereof, except that bodies of water confined to and retained within the limits of private property, and which do not develop into or constitute a nuisance, or a public health hazard, or a menace to fish and wildlife, shall not be considered to be "waters of the state" under this definition (Section 19-5-102)".

For 303(d) assessment purposes, DWQ reports on the following surface waters of the state:

- Rivers and streams
- Springs
- Seeps
- Canals as identified in site-specific standards in UAC R317-2
- Lakes and reservoirs

All other waters, such as ground water, are reported through other programs within DWQ. For more information on these waterbodies and their reports, please refer to **DWQ's webpage**.

Waterbody Types

Utah assesses waters at the monitoring-site level and then rolls the site-level assessments up into the assessment-unit scale. Each monitoring site can only represent one waterbody type (Table 3). The monitoring locations are categorized by considering the definitions in Table 4 and applying best professional judgment (BPJ) where a site may be representative of another waterbody type. For instance, a monitoring location for a spring may be representative of downstream water quality in a stream.

Table 3. Waterbody Types Used for Categorizing Monitoring Locations

Waterbody Type	Description
Rivers and Streams	A body of running water moving under gravity flow in a defined channel. The channel may be entirely natural or altered by engineering practices such as straitening, dredging, and/or lining. Both perennial and intermittent rivers and streams are included in this category. Ephemeral rivers and streams are not included in this definition and are not reported on in the Integrated Report. *Note*: If specific samples for this waterbody type were collected under stagnant conditions, the samples and data records will be flagged and not considered in the assessment of the monitoring location site because these samples are not representative of free-flowing conditions.
Springs and Seeps	A body of water or location where the water table intersects the land surface, resulting in a natural flow of groundwater to the surface. Perennial, intermittent, and ephemeral springs and seeps are assessed, provided they are moving under gravity flow and connect or contribute to a river or stream. *Note:* If specific samples for springs or seeps were collected during conditions that do not fit the above description, the samples and data records will be flagged and not considered in the assessment of the monitoring location site.
Canals (General, Irrigation, Transport, or Drainage)	A human-made water conveyance. *Note*: Canals are only assessed when identified in the site-specific numeric criteria in UAC R317-2-14 or are named in the list of waters with designated classifications in UAC R317-2-13.
Lakes and Reservoirs	An inland body of standing fresh or saline water that is generally too deep to permit submerged aquatic vegetation to take root across the entire body. This site type may include expanded parts of a river or natural lake, a reservoir behind a dam, or a natural or excavated depression containing a waterbody without surface-water inlet and/or outlet.
Wetlands	Waterbodies that are inundated or saturated by surface or groundwater at a frequency and duration

	sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. *Note*: Wetlands are assessed as part of DWQ's 305(b) reporting on the state of Utah's waters but are not assessed by the 303(d) program. Utah is in the process of defining use classes and developing water quality standards for wetlands.

Waterbody types for which 303(d) assessment methods are under development

Great Salt Lake (GSL)

DWQ is currently developing methods for the assessment of the Great Salt Lake and will not be assessing this waterbody for 303(d) purposes in 2016. DWQ will, however, provide a status update on the monitoring, management, and progress DWQ is making towards developing an assessment methodology for the lake.

Wetlands

DWQ is actively pursuing projects that continue to develop, test, and refine wetland condition assessment frameworks for GSL wetlands. For 2016, this waterbody will not be assessed for 303(d) reporting purposes. Instead, DWQ will report on two main areas: an evaluation of stressors associated with impounded wetlands of the Great Salt Lake and biological responses of Great Salt Lake marsh wetlands.

Assessment Units

Assessment units (AUs) are portions or segments of assessed waterbodies of the state for which water quality assessments are summarized and reported to EPA and stakeholders in the 303(d) list (Table 4). Depending on the waterbody type being assessed, AUs can take several forms. Figure 1 offers a graphical representation of the multiple types of AU delineations. Examples include:

- Watershed areas where both main-stem streams and their tributaries are combined in a single AU
- Lakes or reservoirs which are defined by the NHD delineation of the waterbody are typically a single unique AU
- Ribbon AUs comprised of the length of a main-stem river that does not include tributaries

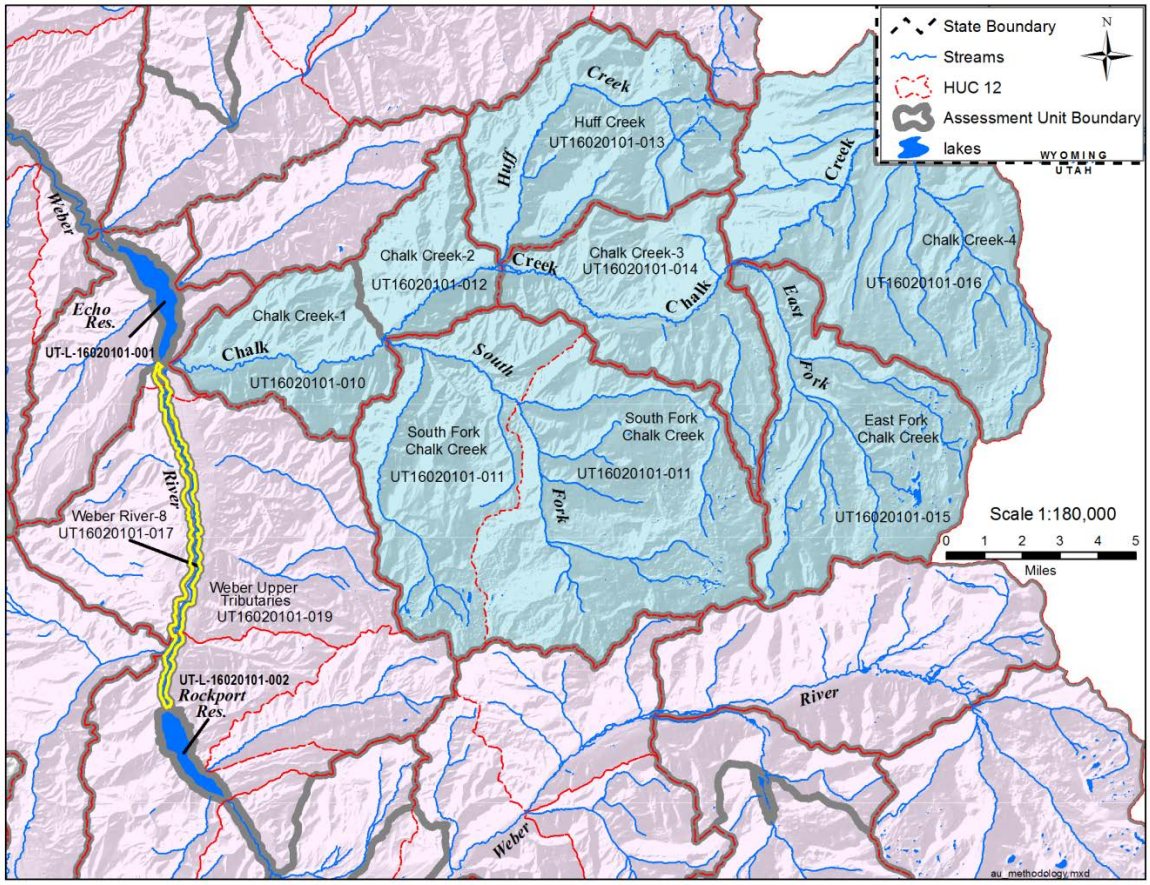


Figure 1. DWQ Assessment Unit Delineations

UAC R317.2-13 contains descriptions of waterbodies which are the basis for defining the geographical extent of Utah's AUs. These descriptions are mapped using GIS tools, and the water-quality standards designed to protect these waterbodies are assigned to the AUs and the monitoring locations contained within their boundaries. At times, monitoring locations may be situated in an adjacent AU based on their geographical location but are more representative of an upstream reach of an AU. In such a situation, the uses and AU identification number of the upstream AU may be applied on a case-by-case basis.

Waters within and Shared with Other States

Though there may exist readily available data from locations near Utah's state boundaries, DWQ only assesses, for 303(d) purposes, monitoring location sites that are within the jurisdictional boundaries of the state. Rivers, streams, springs, seeps, and canals that flow into Utah but originate outside of Utah's borders will be assessed using DWQ monitoring locations residing within state boundaries. Lakes and reservoirs that overlap with other state jurisdictions (e.g., Lake Powell, Bear Lake, and Flaming Gorge) will be assessed using the monitoring locations that fall within Utah state jurisdictional boundaries. For these larger lakes, UAC R317.2 specifies which portions of the lakes are assessed by Utah's water quality standards.

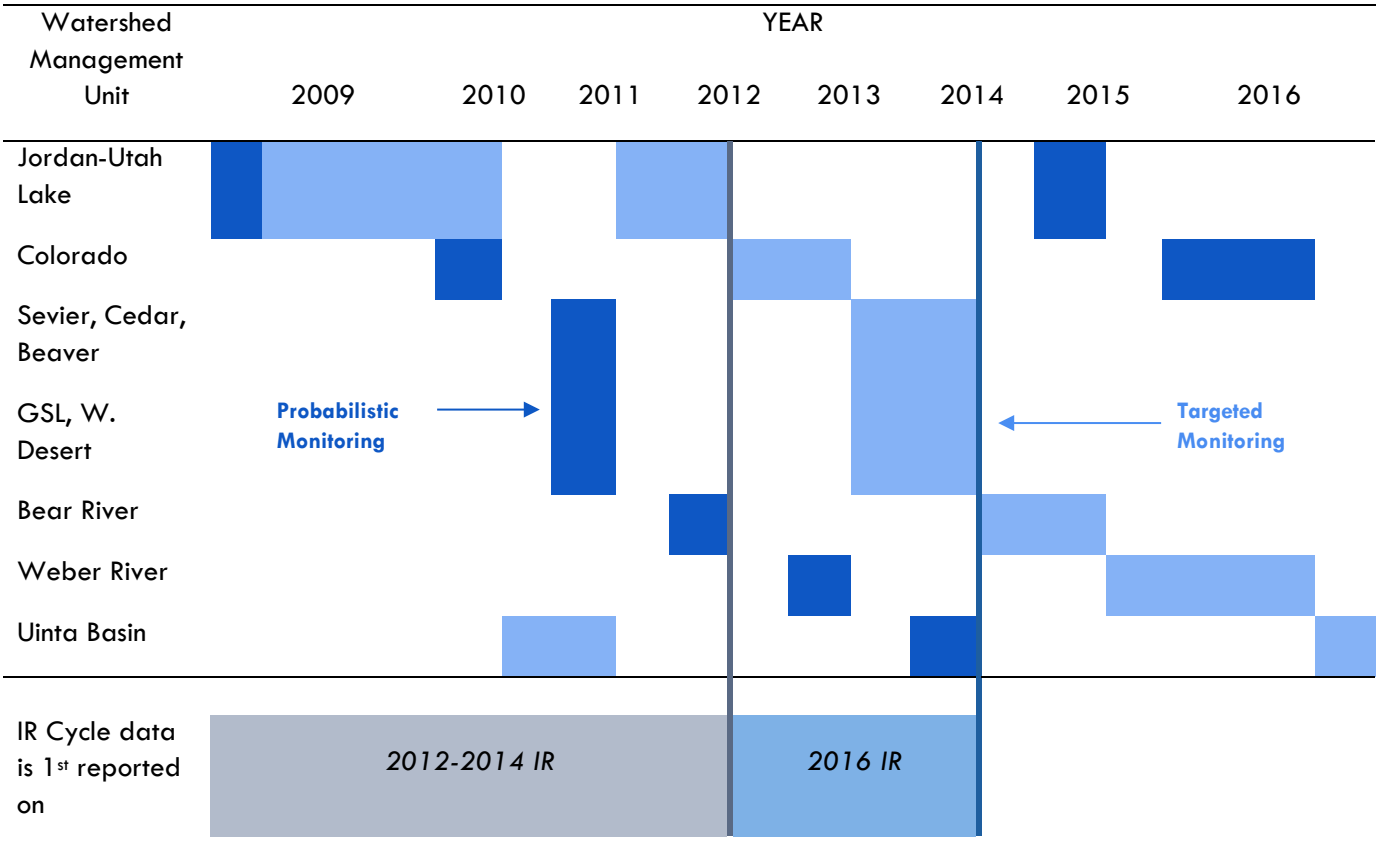
As resources allow, DWQ will work with neighboring states on any impairments that fall close to jurisdictional boundaries in other states by notifying the neighboring state of the impairments or exceedances and available data relevant to the impairment.

Monitoring and the Rotating Basin

To help coordinate and prioritize water-quality monitoring and planning throughout the state, DWQ uses a "rotating basin" approach. Designed to meet the reporting requirements of the 305(b) component of the IR, DWQ begins monitoring a watershed management unit (WMU) through 50 randomly selected sites to better understand the significant causes on pollution throughout the WMU. Following the initial probabilistic-monitoring efforts within a WMU, DWQ returns to the watershed two years later for more intensive sampling based on the probabilistic-survey results and different programmatic needs within DWQ.

The following schedule sets out the relationship between the basin reviews and when assessments generated by those reviews are incorporated in the 303(d) Listing process for the first time.

Table 4. Summary of DWQ's 6-year Rotating Basin Monitoring Schedule and the Integrated Report (IR) Data Reporting Cycle



Though DWQ will consider and assess any readily available data throughout the state that falls within the Assessment Program's Data Quality and Procedures outlined on DWQ's Call for Data web page, datasets collected by DWQ will be heavily focused in the Colorado, Sevier/ Cedar/ Beaver, and Great Salt Lake/ West Desert Watershed Management Units for the 2016 cycle.

For more information on DWQ's Watershed Management Units and DWQ's rotating basin plan, please refer to DWQ's Watershed Protection and Monitoring and Reporting web pages.

Credible Data: General Requirements

A key component of assessing a waterbody against numeric criteria as defined in **UAC R317-2** is ensuring that the data and information from different sources is comparable, sufficient in size, representative, and of good quality. To minimize potentially flawed assessment decisions based on inaccurate data, DWQ will evaluate all chemical, physical, and biological data used in assessing waters of the state against the following interpretive, sampling, and analytical considerations and protocols.

Data Types

As referenced in 40 CFR §130.7(b)(5) DWQ will consider all existing and readily available data. However, based on the type of data submitted to or obtained by DWQ during the Assessment Program's Call for Data for generating the IR and 303(d) list, the data may not be appropriate for 303(d) assessments. As recommended in EPA's July 29, 2005 Guidance, DWQ will consider several quantitative and qualitative types of data described in Table 5 for 303(d) assessments (2006 Integrated Reporting Guidance).

Table 5. Summary of Data Types Considered in 303(d) Assessment Analysis Work

Quantitative Data	Qualitative Data	
• Laboratory or field data for parameters contained in Utah's Water Quality Standards (UAC R317-2) and Safe Drinking Water Act Standards (UAC R309-200) • Segment-specific ambient monitoring of biological measures of health (O/E Scores)	• Observed Effects (e.g. fish kills) • Complaints and comments from the public • Human Health/Consumption closures, restrictions, and/or advisories	•

Data types not included in Table 5. will be used by the Assessment Program but not necessarily for 303(d) evaluation purposes. To review how other data types will be used by the assessment program, please refer to the **Data Type Matrix**.

Period of Record

Quantitative and qualitative data types that are used for a 303(d) analysis are separated into two groups based on water year (Table 5). Using DWQ's 6-year rotating basin monitoring schedule as a guide, DWQ defines the period of record for a 6-year assessment from October 1, 2008 – September 31, 2014 for the 2016 IR.

Data and information from the 6-year assessment are considered to be most reflective of the current conditions of a waterbody. Provided the data from this record period meets the interpretive, sampling, and analytical considerations and protocols outlined in this document and on the Assessment's Call for Data website, DWQ will analyze and assign EPA- and state-derived assessment categories to the assessed waterbodies from this record period (Table1).

Data and information that are older than the 6-year period of record will be considered if information or a rationale with supporting documentation shows that the data are reflective of current conditions. If there is

DWQ-approved evidence that the data is reflective of current conditions, the data will be assessed in the same manner as data and information from the 12-year assessment group. If there is none, or not enough supporting evidence that the data is reflective of current conditions, DWQ will not consider the information and data older than 6-years in the current IR and 303(d) List. Instead, DWQ will encourage the data submitter to collect newer information and submit that data and information in future calls for data.

Newer Data and Information

Quantitative and qualitative data types that are considered in 303(d) assessments but are collected or represent conditions after the closing date specified in the call for data request (after September 30, 2014 for the 2016 IR) are not considered in the current reporting cycle. DWQ does not include these newer datasets because of the time required to compile data, perform data quality checks, format data from different sources, assess, review assessments, and generate the IR and 303(d) for public comment by April1of even- numbered years. If more recent data are submitted, they will be retained and utilized in the subsequent assessment cycles. For more information, please refer to the General FAQs section on the **Call for Data** website.

General Credible Data Requirements

All biological, physical, and chemical data and information that fall within the defined period of record for an assessment cycle are evaluated against a series of sampling, analytical, and interpretive protocols. These protocols include an evaluation of sample site geospatial information, Quality Assurance Quality Control (QAQC) field and laboratory protocols, sampling and laboratory methods, analytical detection limits, field observations, and variability within a dataset. Data that meet DWQ's credible data requirements will be evaluated against the numeric criteria associated with the beneficial uses assigned to waterbodies in UAC R317-2. Data and information that do not meet DWQ's credible data requirements will receive a rejection flag and justification. At no point during the data evaluation or assessment process will DWQ intentionally delete or remove data from a dataset.

Sampling Location

To assess a waterbody against the numeric criteria assigned in **UAC R317-2, DWQ** must review all of the sampling location information associated within the 6-year datasets. This process involves validating the sample-site geospatial information in GIS, assigning beneficial uses to DWQ-validated locations, and merging sampling locations and their associated data where sites are representative of the same waterbody or segment. At a minimum, the information that must be included with a sample location measurement is:

- Monitoring location ID (MLID)
- Monitoring location name
- Monitoring location description
- Monitoring location waterbody type
- Waterbody type description
- Monitoring location latitude/longitude measurements and associated meta-data as defined on the Assessment Call for Data website
- Monitoring location elevation measurements and associated meta-data as defined on the **Assessment Call for Data web page**
- County
- State

If, during DWQ's geospatial review of the sampling location information, a sampling site has insufficient or inaccurate information (e.g., it cannot be mapped or is improperly recorded by the sampler in the field), the

sampling location and its associated data will not be included in the assessment process of assigning an EPA- and state-derived assessment category (Table 1). Stakeholders will be able to review any rejection results from this evaluation process during the draft IR and 303(d) List public comment period.

Credible data

Where beneficial uses can be assigned to a DWQ-validated and approved monitoring location, DWQ will then consider the scientific rigor of the sampling information and measurements associated with that site. To assess the validity of the sampling and analytical protocols associated with a sample measurement, DWQ uses a data-type-specific credible-data matrix. As noted in the credible-data matrices on the Assessment's Call for Data website, each credible-data matrix considers the field and laboratory QAQC protocols, sampling and laboratory methods, analytical detection or instrumentation limits, and field observations associated with a sample measurement. Based on the level of information provided and the strength of the meta-data associated with the sample measurement, DWQ can assign a grade level (A-D) to the associated sample measurement(s).

Measurements that receive a grade A or B are considered to be of high quality by DWQ and will be considered and used by DWQ in the process of assigning an EPA- and state-derived assessment category to a waterbody (Table 1.). Measurements that receive a grade C or lower are considered by DWQ to be of lower-quality and are not used for assessment and 303(d) listing purposes. Though DWQ does not use this lower-grade data for generating the IR and 303(d) List, the Assessment Program still considers some of the lower-quality data for different programmatic purposes such as targeted/future monitoring.

Representative data

To minimize potentially flawed assessment decisions that are driven by extreme events, DWQ screens all high-quality (Grade A or B) data for representativeness. For IR and 303(d) assessment purposes, examples of extreme events include but are not limited to:

- Accidental spills of toxic chemicals
- Scouring storm flows that lead to diminished aquatic-life beneficial uses
- Extreme drought conditions

Given the scope of these assessments, it is not always possible to identify where such circumstances may be influencing a specific sample, but DWQ will consider any evidence presented that a sample is not representative of ambient conditions. Where these conditions are present in a dataset, DWQ will run the analysis without the extreme events/data record and will apply and document an appropriate assessment result for the waterbody using the methods outlined below.

Assessed Waterbodies

Parameter Assessment under Development -Evaluation of Indicators

Several parameters in **UAC R317-2** have footnotes indicating that further investigations should be conducted to develop more information when levels are exceeded. Parameters and beneficial-use combinations with these footnotes are noted in Table 5.

Table 6. Assessment Decision for Parameters and Beneficial Uses

Parameter Name	Beneficial Uses	Special Assessment Notes
BOD	2A, 2B, 4, 3A*, 3B*, 3C*, 3D	Note: Where exceedances do occur, these assessment units will be Category 3D: Further investigation needed.
Gross Alpha	3A, 3B, 3C, 3D	Note: This parameter will be assessed as a toxicant and appropriately categorized based on results of the assessment.
Gross Beta	3A*, 3B*, 3C*, 3D*	Note: This parameter will be assessed as a toxicant and appropriately categorized on the basis of results of the assessment.
Nitrate as N	1C, 2A, 2B, 3A*, 3B*, 3C*	Nitrate as N in assessed waterbodies of the state with a 1C beneficial use is considered an inorganic toxicant and will be assessed as so. (UAC R317-2) Note: Parameter will be assessed as a toxicant, but all categorical assessments for aquatic life uses (Class 3) will be overwritten to Category 3D until DWQ adopts new criteria. See the Addressing Nitrogen and Phosphorus section of this document.
Total Phosphorus as P	2A, 2B, 3A*, 3B*	Note: Phosphorus will be assessed in the same manner as toxic parameters, but all categorical assessments will be overwritten to Category 3D until DWQ adopts new criteria. See the Addressing Nitrogen and Phosphorus section of this document.

Note: Assessment decisions articulated in the notes section of the table will be applied to all assessed waterbodies of the state identified in Table 4.

Addressing nitrogen and phosphorus

DWQ is currently developing a multifaceted nutrient reduction program to address water-quality problems associated with nitrogen and phosphorus pollution. One important aspect of this program is the development of assessment methods that accurately identify streams and lakes with nutrient-related problems.

Development of robust assessments to address nitrogen and phosphorus pollution is important for several reasons. There are many different nutrient responses with the potential to degrade the designated uses of aquatic ecosystems (Fig. 2). Each causal path needs to be assessed to ensure that excess nutrients are not resulting in water quality impairments. Moreover, there are several physical characteristics (shading, temperature) of these systems that both reduce and exacerbate nutrient responses. Further complications arise because different deleterious responses manifest at different times of the year. Together, these complications mean that it is not easy to generalize about the concentration of nitrogen and phosphorus that must be avoided to ensure ongoing support of designated uses, nor a single, isolated ecological response that can reliably identify nutrient-related problems.

DWQ is developing comprehensive assessment methods that use multiple lines of evidence to accurately identify sites with nutrient-related problems. These assessments incorporate both historic and recently developed (Ostermiller et al. 2014) water-quality indicators to accurately assess whether excess nutrients have degraded conditions to the extent that the designated uses are impaired. DWQ anticipates publishing and seeking public comment on draft procedures for conducting nutrient-related assessments during the reporting cycle for the 2016 Integrated Report. DWQ's website will provide updates on this document.

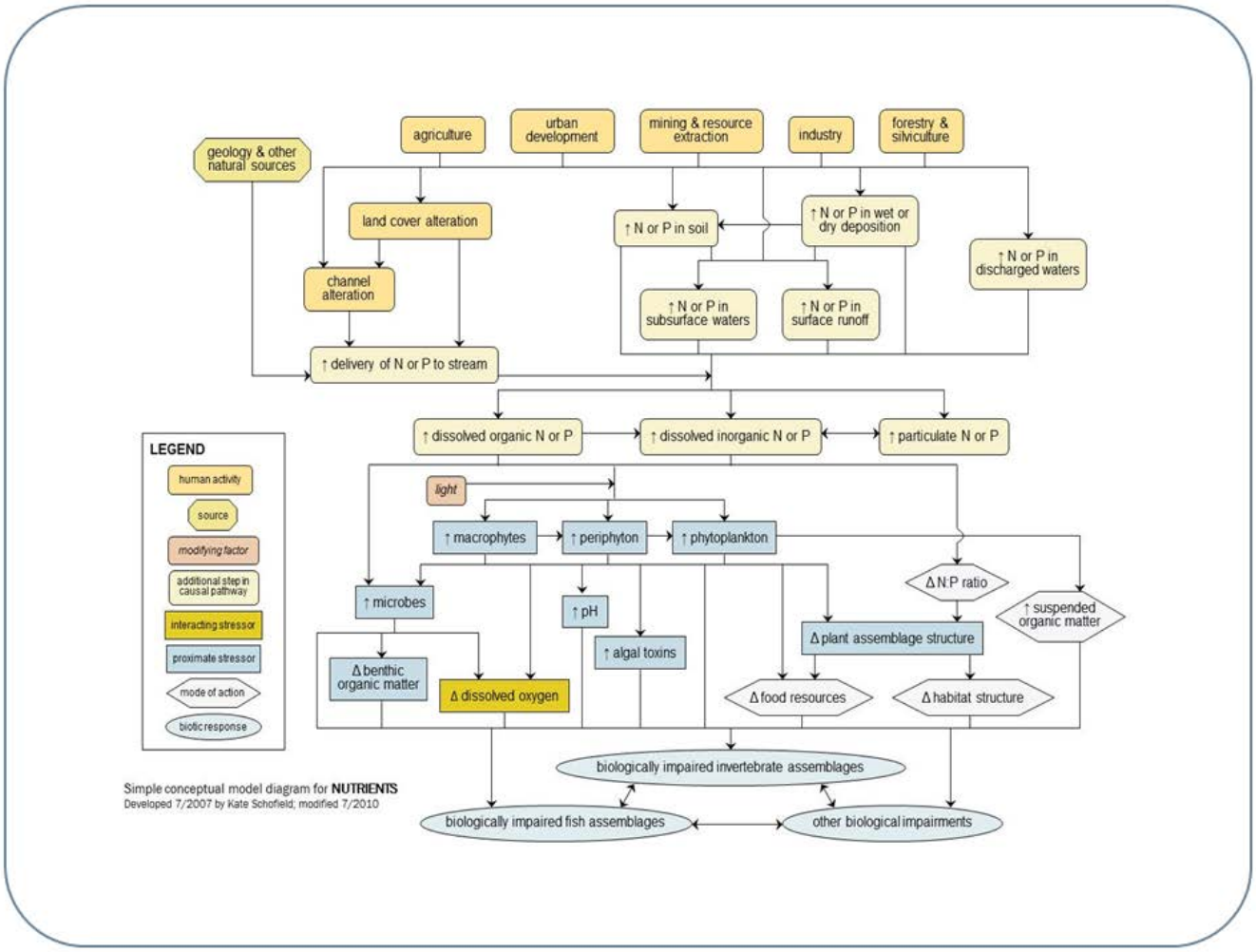


Figure 2. A Conceptual Model of Nutrient Sources and Their Impacts on Aquatic Ecosystems

Screening values

DWQ may also use percent saturation of dissolved oxygen as a screening value for sites that may exhibit high daytime values above 110 percent saturation. As discussed in peer-reviewed literature and white papers, the collection of dissolved oxygen using grab sampling methods is problematic in that single daytime measurements may not be indicative of nighttime minima. As algae produce dissolved oxygen during the day, excessively high saturation values may indicate that the stream may exhibit a corresponding drop in dissolved oxygen as the algae respire during the night. Therefore, the saturation data may be evaluated to guide decisions regarding assessment results and prioritizing sites for future monitoring.

High frequency/ continuous data- Proposed

DWQ is in the process of developing methods for integrating continuous monitoring datasets into the assessment program. Continuous monitoring, in which measurements are collected at a relatively high frequency (e.g., 1, 5, 15, 30 minutes), provides a more comprehensive assessment of water quality than discrete or "grab sample" monitoring (EPA 1986). In addition, continuous data also reveals daily, weekly, monthly, and seasonal variability, which allows more accurate calculation of the frequency and duration of violations of water quality standards. This is especially true for conventional field parameters known to vary widely and systematically on a daily basis (i.e., dissolved oxygen concentration and saturation, specific conductance, pH, temperature, and turbidity). Although there are significant benefits of using high-frequency data for assessments, the large datasets generated by such monitoring can be a challenge to manage, QA/QC, and apply in an assessment context. DWQ's current assessment methodology was designed primarily to evaluate discrete measurements because until recently high frequency data were prohibitively expensive to measure routinely. While DWQ maintains the flexibility to interpret discrete data for assessment purposes, these data did create incongruity for many water quality standards with averaging periods that are measured at a sub-daily scale. However, recent advances in technology continue to make obtaining these data more affordable and therefor readily available. To accommodate these data, DWQ needs to rethink current assessment methods.

This section details DWQ's proposed methodology for evaluating high-frequency data for assessments. In the *2016 Integrated Report*, DWQ will pilot this methodology to evaluate existing dissolved oxygen listings in the lower Jordan River. The lower Jordan River AU has the most robust set of high-frequency data available in an impaired reach in the state. This piloting exercise will inform future iterations of DWQ's assessment methodology for high frequency data that will continue to evolve in future assessment cycles. Thus, this assessment methodology is subject to iterative change as more rigorous methods are developed.

The following rules were derived from the USEPA's guidance "Ambient Water Quality Criteria for Dissolved Oxygen" (EPA, 1986) which provides the basis for Utah's existing criteria and an associated rationale for interpretation of field collected data. The following underlying assumptions found in the EPA's guidance manual have been considered in the proposed assessment methodology:

- Chronic criteria were originally designed to be protective of reductions in fish population(s)
- Acute (1-day minimum) are intended to protect against lethal effects
- Presence/absence of sensitive species are crucial in consideration of cold and warm water fisheries

The following additional considerations have also been incorporated into our proposed methodology:

1. Event duration
2. Magnitude of dissolved oxygen (DO) diurnal depression
3. Frequency of reoccurrence
4. Spatial extent of degradation
5. Biological significance of site in question

Utah Administrative Code R317.2 defines numeric values for 30-day mean, 7-day mean, and instantaneous minimum dissolved oxygen criteria (Table XXX). The 30-day and 7-day averaging periods are chronic criteria are intended to be protective of degradation in the long-term productivity and health of fisheries.. The acute (1-day Minimum) criteria is intended to protect against lethal effects of low dissolved oxygen of sensitive life stages of cold- or warm-water fish.

Dissolved Oxygen Assessments

As part of the high-frequency pilot project DWQ will utilize (4) sites on the lower Jordan River, Utah: 2100 South and 1100 West (MLID # 4992320), 800 South above drain outfall (MLID #4992050), 300 North (MLID # 4991900) and Cudahy Lane above South Davis waste water treatment plant (MLID # 4991820) The data was recorded in (15) minute intervals and span the summer months of 2014. The sondes used in data collection at each of the sites are YSI EX01 multi-parameter sondes. Discrete data samples will be plotted and utilized in the initial analysis to evaluate potential drift and error in sensor data. Where applicable these grab samples may be utilized for sensor correction.

Table 7. Site specific dissolved oxygen criteria for aquatic life use support determination for the Jordan River, Surplus Canal and State Canal

Minimum DO (mg/l)	May-July	August-April
30 Day Average	*5.5*	*5.5*
7 Day Average	*5.5*	NA
Minimum	*4.5*	4.0

DO Averages (7-day and 30-day)

DWQ will assess against the 7-day and 30-day average dissolved oxygen criteria using a rolling average of the daily mean DO calculated from the observed daily maximum and minimum observations. This methodology is consistent with EPA guidance (EPA 1986). Maximum values greater than saturation will be reduced to saturated concentrations prior to calculating daily means. The analysis for the lower Jordan River will be divided into the two seasons defined in the site-specific standards for the Jordan River (Table 7). If there are more than 30-days of data available moving 30-day and 7-day averages will be calculated and utilized to determine assessment status flowing the process outlined in Figure 3.

DO Minima

A criteria expressed as either a minimum or "not less than at any time", an excursion relative to the minimum criteria occurs when the concentration over a 24-hour period is below the criterion for at least an one-hour duration. DWQ's assessment of DO minima will allow for up to 10% of DO measurements during a 24-hour period to exceed the minimum value. If more than 10% of the data are below the minimum during a 24-hour period, the site will be considered impaired. In addition, a minimum of three such instantaneous excursions at the same location during three or more consecutive 24-hour periods may be considered as an impairment of aquatic uses. For large high-frequency datasets, relative frequency and magnitude of the exceedances within the dataset are also considered to determine non-support of the designated use.

Duration of exceedance for minimum

In the assessment, specific duration applicable to the criterion for the parameter being assessed will be taken into consideration. For example, chronic aquatic life criteria require a four-day exposure period; therefore, data collected under flow conditions that last less than four days (as is generally the case for high flow conditions) are not considered valid for assessment of chronic aquatic life criteria but such data may be used to assess acute aquatic life criteria, which do not have such duration constraints.

Note: These methods are a draft proposed procedure for evaluating continuous dissolved oxygen data. They are subject to change and additional evidence and supporting documentation may be added for performing assessments of this data type.

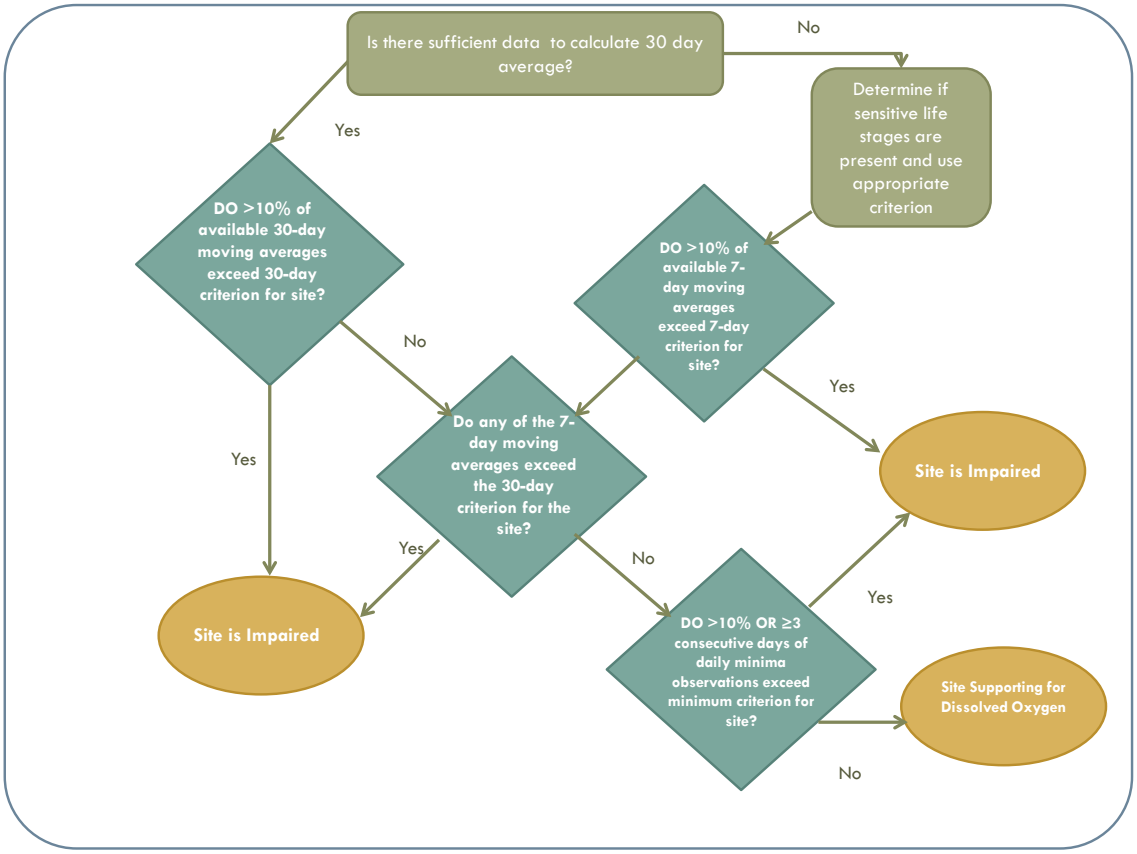


Figure 3. Flow diagram of assessment methods for continuous dissolved oxygen data.

E. COLI ASSESSMENTS

Data Preparation

Following a credible data review and additional QAQC checks as outlined in DWQ's QAPP, DWQ compiles all credible data within the period of record of concern and makes several adjustments based on the reported limits and sampling frequencies necessary to conduct the assessment. Similar to the other QAQC and assessment procedures outlined in this document, the raw data and accompanying meta-data values in *Escherichia coli (E. coli)* datasets are not altered; instead, a series of database comments and flags are used.

Recreation Season

To ensure protection of recreation uses, *E. coli* assessments will be conducted on data collected during the recreation season from May 1 through October 31. The recreation season may be adjusted either longer or shorter based on site-specific conditions. Any site-specific adjustments made to the recreation season will be documented in the Integrated Report (IR).

E. coli Collection Events and Replicate Samples

Due to sampling design, datasets at a single sampling location may contain replicate samples or multiple samples collected in the same day. For *E. coli* assessments, single daily values, or collection events, are required. DWQ defines a collection event as:

- The daily MPN result value
- A Geometric Mean of Replicates where multiple samples are collected on the same day
- The daily MPN as a quantified value reported as being obtained from a dilution

In cases where there is a quantified MPN value reported from a dilution and the value reported is greater-than-detect, the quantified value will be used as the collection event for assessment purposes. Furthermore, MPNs reported as greater-than-detect are not used to calculate the geometric mean for the collection event.

Data Substitution for Calculating the Geometric Mean

Attainment of *E. coli* standards are assessed using the geometric mean of representative samples. *E. coli* data that are reported as less than detect (<1) or 0 will be treated as a value of one to allow for the calculation of a geometric mean. Similarly, *E. coli* data that are reported as greater than detect (>2419.6) will be treated as 2420 to allow for the calculation of the geometric mean.

Use Designation

Once the data are compiled as described above, DWQ assesses use support for each monitoring location. All Waters of the State are classified for contact recreation (Class 2) and some waters are classified as drinking water sources (Class 1C). These uses have associated specific *E. coli* standards that are used for determining use support. The following default use-classifications will be used for waters that are not designated for specific uses in UAC R317-2:

- Lakes and reservoirs not designated in UAC R317-2 as 2A are designated as Class 2B waters by default. If a lake or reservoir is >10 acres and not listed in UAC R317-2.13.12, the lake or reservoir is assigned by default to the classification of the stream with which they are associated.
- River and streams, springs, seeps and canals that are unclassified and do not have assigned beneficial uses in DWQ data records, will be assigned default beneficial uses as articulated in UAC R317-2-13.9,13.10,13.11, and 13.13.

Based on the beneficial use assignments to a waterbody or segment within a waterbody, the numeric criteria within UAC R317-2 are applied to Class 2 and Class 1C uses.

Annual Recreation Season Assessment

The first step in the assessment process for lakes and reservoirs is to determine if there were two or more beach closures or health advisories in a recreation season. Lakes and reservoirs with two or more closures or advisories are impaired and no further assessment is conducted (Fig. 3). If there were less than two closures or advisories, or the AU is a river or stream, the assessment process continues using *E. coli* concentrations.

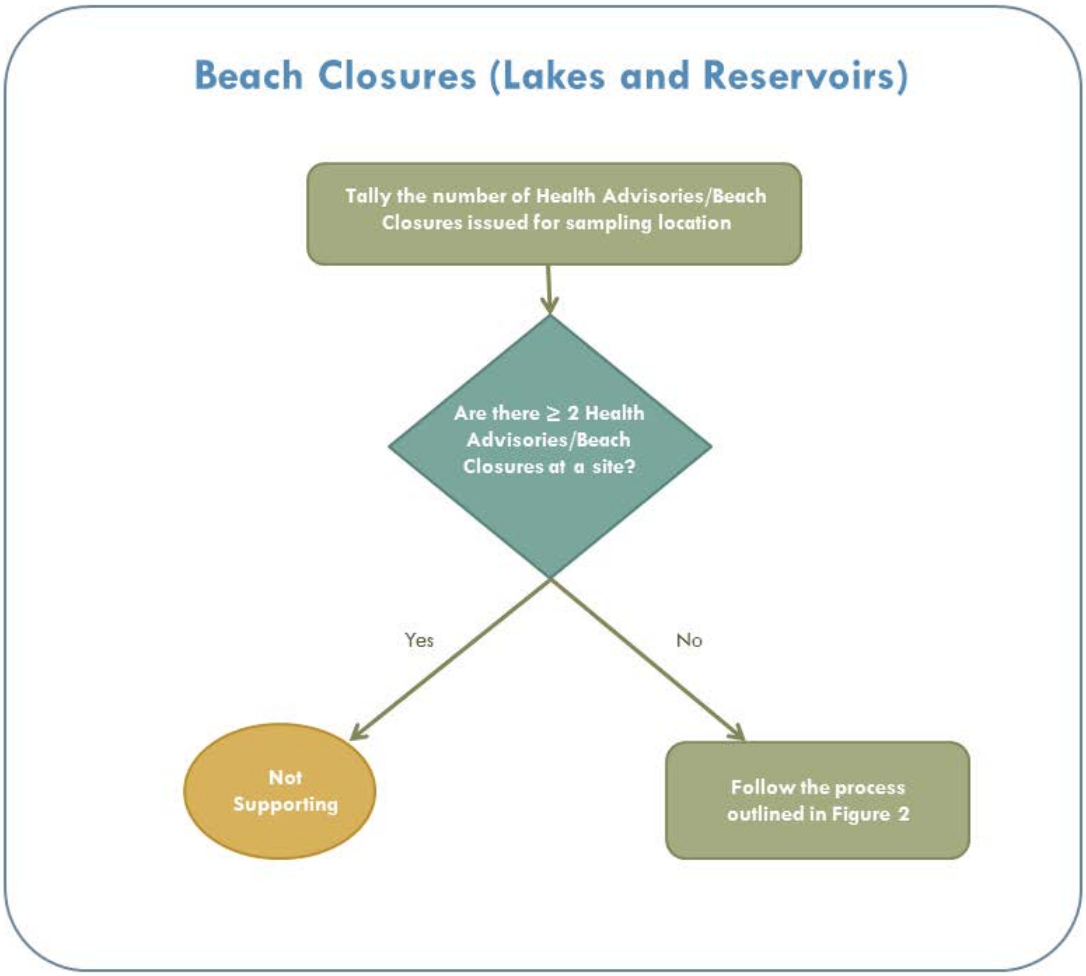


Figure 4: Lakes and Reservoirs with Two or More Closures or Advisories

To ensure protection of recreation and drinking water uses of assessed waterbodies of the state, DWQ considers three approaches based on sampling frequency and the number of collection events at a sampling location:

- A seasonal assessment against the maximum criterion
- A 30-day geometric mean assessment
- A seasonal geometric mean assessment (Figs 4, 5, and 6)

Each monitoring location is assessed against the maximum criterion first if there are five or more samples (Fig. 5).

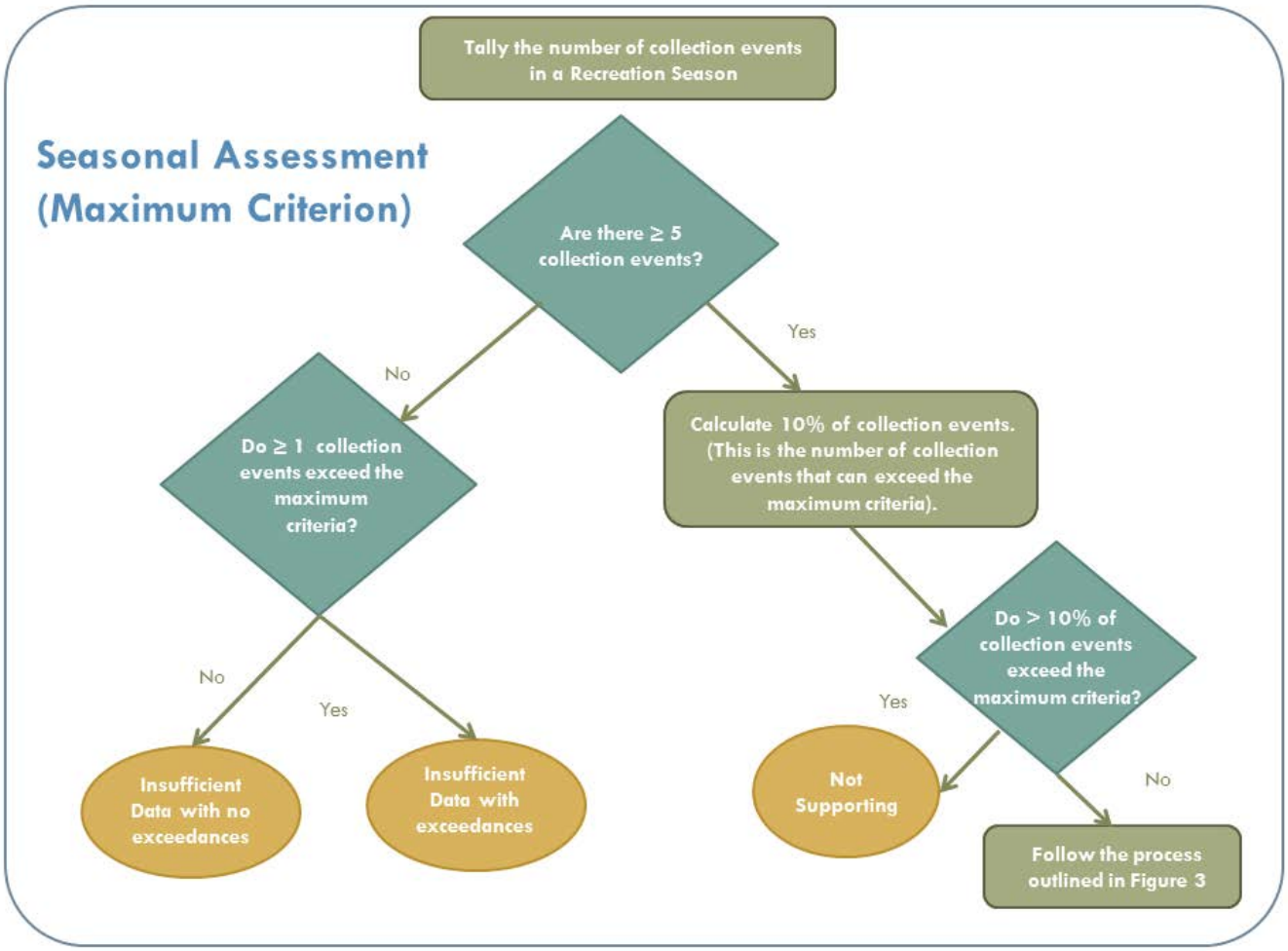


Figure 5. Process of Seasonal Assessment Using the Maximum Criteria at a Sampling Location

If less than 10 percent of collection events exceed the maximum criterion, the site is then assessed using the 30-day geometric mean criterion (Fig. 6). In order to assess against the 30-day geometric mean criterion directly, there must be a minimum of five collection events in 30 days, with at least 48 hours between collection events. This ensures that collection events are adequately spaced and are representative of ambient conditions.

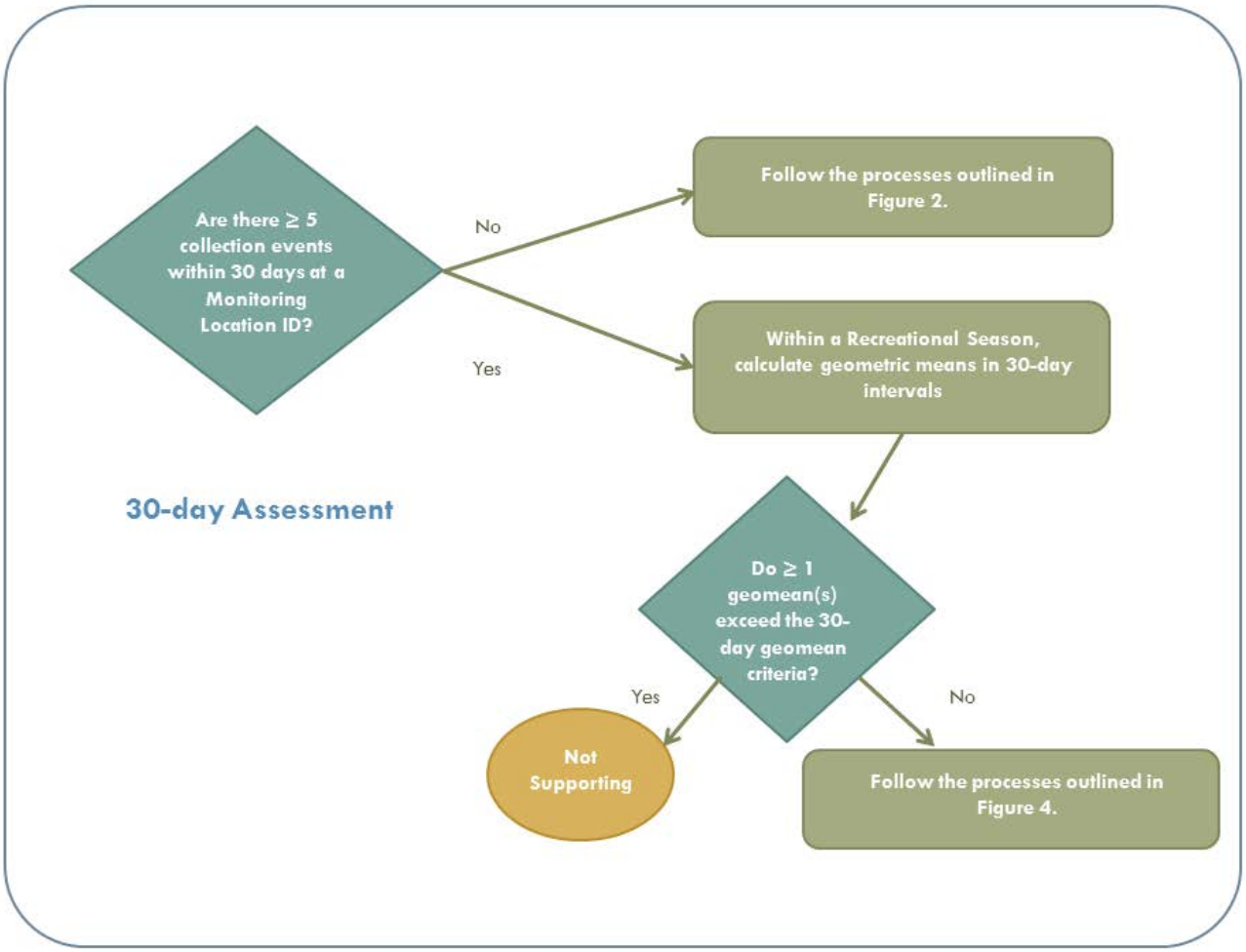


Figure 6: Assessment process using the 30-day geometric mean for sampling locations with five or more collection events within 30 days

If adequate (at least five samples) and/or representative data spaced by at least 48 hours are not available to assess against the 30-day geometric mean, DWQ will assess *E. coli* data for the recreation season provided there are at least 5 collection events during the season (May – October). Exceedances of the geometric mean criterion will result in the site being classified either as impaired (minimum of 10 collection events in a recreation season) or as insufficient data (sample size is more than five but less than 10) (Fig. 7).

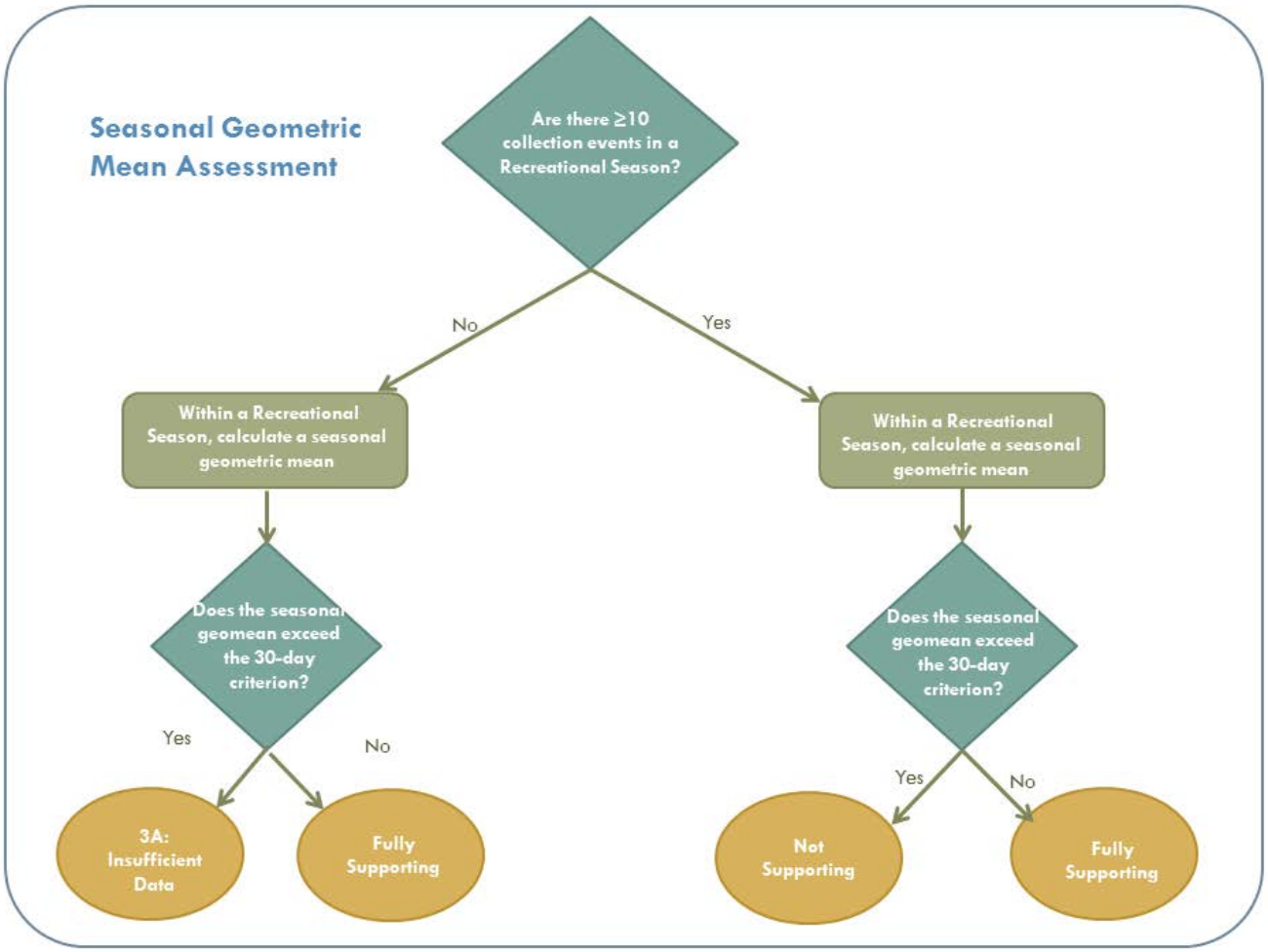


Figure 7: Assessment of *E. coli* for the Recreation Season

Summarizing Assessment Results

When determining the attainment of a sampling location with assessment results across multiple years, the following rules are applied:

Fully Supporting (Category 1 or 2)

- No evidence of impairment by any assessment approach for all recreation season over the most recent six years. This includes category 3A conclusions and Category 1 or 2 conclusions. A fully supporting determination can be made with a minimum of five collection events during the recreational season.

Insufficient Data or Information Assessment Considerations (Category 3A)

- Sites with four or fewer samples in all seasons evaluated will be listed as not assessed, provided impairment is not suggested by a posted health advisory or beach closure. This applies at lakes and reservoirs only.
- All Category 3A sites will be prioritized for future monitoring, especially if limited data suggest impairment.

Not Supporting (Category 5)

A waterbody is considered to be impaired (not meeting its designated uses) if any of the following conditions exist:

- A lake or reservoir that has two or more posted health advisories or beach closures during any recreation season
- Any monitoring location where *E. coli* concentrations from 10 percent or more of the collection events exceed the maximum criterion
- Any monitoring location where the 30-day geometric mean exceeds the 30-day geometric mean criterion (minimum five collection events with at least 48 hours between collection events).
- Any monitoring location where the recreational season (May – October) geomean exceeds the 30-day geometric mean criterion (minimum of 10 collection events).

Not Supporting or Threatened but No TMDL Required (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:

- A state-developed TMDL has been approved by EPA, or a TMDL has been established by EPA for any segment pollutant combination (Category 4A).
- Other required control measures are expected to result in the attainment of an applicable water-quality standard in a reasonable period of time (Category 4B).
- The nonattainment of any applicable water quality standard for the segment is the result of pollution and is not caused by a pollutant (Category 4C).

Combinations of Category 3's, 2, and/or 1

When making a final attainment decision of a site after all recreation season assessments are complete, DWQ uses the approach that if there is no evidence of impairment at a site by any of the assessment approaches over the period of record of concern, the assessment analysis from the most recent year outweighs the results from previous years. DWQ has a process for merging assessment results from multiple locations within an AU (Fig. 17).

Combining *E. coli* with Other Parameter Assessment Results

Until the determination of impairment and review of additional supporting information is completed by internal reviewers, parameter assessments at an individual monitoring location and results from multiple monitoring locations within the same AU are not summarized and combined (Categorization of an AU; Appendix 5).

ASSESSMENT OF RIVERS, STREAMS, SPRINGS, SEEPS AND CANALS

Data Preparation

DWQ determines attainment or nonattainment of numeric standards for rivers, streams, springs, seep, and canals by assessing credible data against the numeric criteria in UAC R317-2 through the protocols outlined below. Though *E. coli* and biological assessments also are performed on rivers, streams, springs, seeps, and canals, assessment methods unique to those parameters are described in separate sections of this document.

Results below Detection Limits

Often, environmental-chemistry laboratories report sample results as below their detection limit for a given analytical method. These limits are variously reported as minimum detection limit, minimum reporting limit and/or minimum quantitation limit. DWQ first screens and flags lab result values that are empty and the reported detection limits are higher than water quality criteria in UAC R317-2. These flagged data records are not considered for the analysis. For sample results below detection, the reported result value or a value of

0.5 times the lowest reported detection limit is applied for purposes of the assessment. However, if one-half of the detection limit is above the water quality standard, the data will not be used in the assessment.

Duplicate and Replicate Results

Following credible data requirements and additional QAQC checks as outlined in DWQ's QAPP, datasets may contain duplicate and replicate sample results either due to reporting errors or sampling design. In these cases, a single daily value is determined by accepting the highest result for parameters with not-to-exceed criteria in UAC R317-2, or the lowest reported value for parameters with minimum criteria in UAC R317-2. All data is retained in the assessment dataset and flagged as rejected because of replicate or duplicate values.

Initial Assessment: Monitoring Location Site Level

Once data records reflect the corrections described above, DWQ analyzes each beneficial use for a parameter at a single monitoring location site. DWQ developed this protocol because individual assessments offer a more direct measure of supporting or not-supporting water quality standards in UAC R317-2.

Multiple parameter assessments at an individual monitoring location and results from multiple monitoring locations within the same AU are not summarized and combined until the determination of impairment and additional supporting information is completed by internal reviewers. (see Determination of Impairment: All Assessed Waterbodies).

Conventional Parameters

Currently, DWQ assesses six parameters within UAC R317-2 as conventional parameter and assesses them against the beneficial use-specific criteria established in UAC R317-2 (Table 5). Several waterbodies with conventional numeric criteria have site-specific standards articulated in self-explanatory footnotes within DWQ's surface water standards (UAC R317-2; Table 5). Site-specific standards that require further clarification for 303(d) assessment purposes are noted and explained in Table 8.

Table 8. Conventional parameters and associated designated uses as identified for assessment purposes

Parameters	Designated Uses	Notes
DO*	Aquatic life	Numerous recurrence intervals are listed. Minimum and 30-day averages are used for assessments based on grab samples. Note: Some site-specific standards have been generated, which are used for assessment purposes.
Maximum temperature*	Aquatic life (3A, 3B, 3C)	Note: Some site-specific standards have been generated, which are used for assessment purposes.
pH*	Domestic (1C) Recreation (2A, 2B) Aquatic life (3A, 3B,	Criteria are identical across uses.

	3C, 3D) Agriculture (4)	
Escherichia coli	Domestic (1C) Recreation (2A, 2B)	
Total Dissolved Solids (TDS)	Agriculture (4)	Many site-specific standards have been generated, which are used for assessment purposes. Clarification on how three site specific standards are used for 303(d) purposes are provided below: • For S. Fork Spring Creek from confluence with Pelican Pond Slough Stream to US 89 two seasonal assessments are not performed. Instead, each sample is compared to the monthly corrected criteria in the footnote in UAC R317-2. • Ivie Creek and its tributaries from the confluence with Muddy Creek to the confluence with Quitchupah Creek . If TDS exceeds the site-specific standard, site is not attaining site- specific criteria. If TDS is not exceeding, assess total sulfate. • Quitchupah Creek from the confluence with Ivie Creek to U-10: If TDS exceeds the site specific standard, not attaining site-specific criteria. If TDS is not exceeding, assess total sulfate.
Sulfate	Agriculture (4)	Site-specific criterion associated with sulfate for the following areas: • Ivie Creek and its tributaries from the confluence with Muddy Creek to the confluence with Quitchupah Creek : When TDS is not exceeding site specific criteria and total sulfate exceeds site specific criteria, not attaining. • Quitchupah Creek from the confluence with Ivie Creek to U-10: When TDS is not exceeding site specific criteria and total sulfate exceeds site specific criteria, not attaining.

* Indicate that assessments are performed from field measurement only

A minimum of 10 samples for conventional parameters are required to determine if a site is attaining or not attaining water-quality standards (Fig. 8). Where locations have sufficient sample sizes of 10 or more, 10 percent of the total samples are calculated. This 10 percent calculation becomes the maximum number of samples that can exceed the numeric criteria. For example, if there are 10 samples in a dataset for a site, one sample can exceed the criterion and the site will be still support uses. If more than 10 percent of the total samples collected exceed the criterion, the site is not attaining the beneficial use. If 10 percent or less of the total samples collected exceed the criterion, the site is attaining its beneficial uses. Where locations have insufficient samples to make an attaining or nonattaining determination, DWQ prioritizes the sites and parameters for future monitoring, depending on whether the dataset contains criterion exceedances.

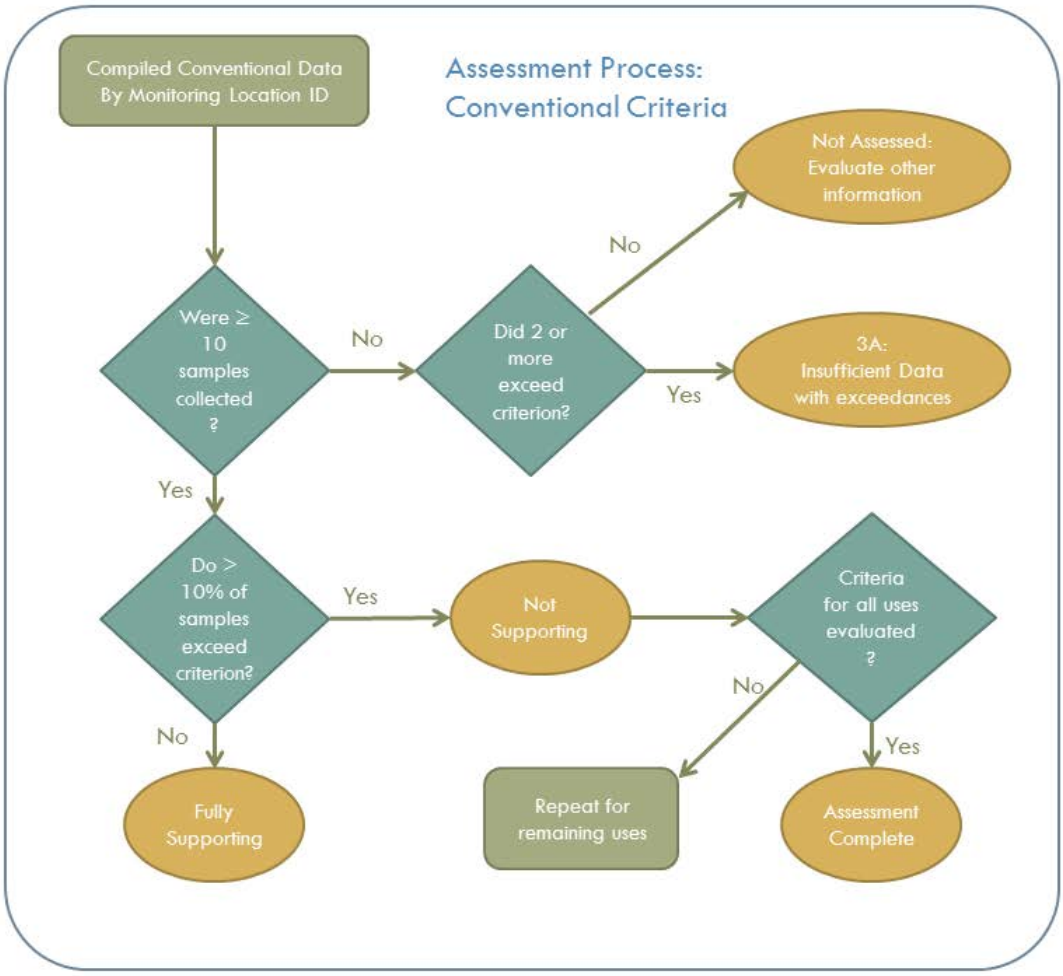


Figure 8. Overview of the assessment process for conventional parameters

Toxic Parameters

DWQ identifies toxics as all parameters within UAC R317-2 that are not defined as conventional parameters (Table 8). Assessment procedures for toxics are more conservative than conventional parameters for the following reasons:

- Many toxic substances accumulate in the tissue of aquatic organisms and become increasingly toxic with prolonged exposure to high pollutant concentrations.
- Toxic substances can biomagnify, or increase, in tissue concentration from lower to higher trophic levels.
- High concentrations of many of these substances can lead to the direct mortality of many species at various life stages.

To ensure protection of designated uses, data are compared against one or more toxic criteria, sample size requirements are smaller, and sites are considered degraded with two or more violations of a criterion.

Multiple toxic parameters can have multiple criteria for a single beneficial use, depending on the averaging period: a lower, chronic criterion and a higher, acute criterion (UAC R317-2). For 303(d) assessment purposes, one daily measurement at each monitoring site is compared to the chronic and/or acute criteria. Currently, the acute and chronic averaging periods defined in UAC R317-2 are not applied for 303(d) assessment analysis because monitoring and sampling frequencies are different and more widely spaced than the acute and chronic periods typically defined in UAC R317-2.

Equation-based Toxic Parameters

A number of toxic criteria are specified as equations rather than specific values (Footnotes, UAC R317-2). The equations include variables of other chemical constituents or water properties that either reduce or magnify the extent to which a toxic is harmful to aquatic life. To properly apply the correction factor equations, it is necessary to use measured data for the variables in the equation to calculate the appropriate numeric criteria for the sample. To calculate the correct criterion for a pollutant-result value, the monitoring location site and date of sample must match between the pollutant of concern and the additional parameter(s) needed for the equation. In the case where there are missing supplemental data values to apply the equation, the following rules will be applied:

- Only hardness-dependent toxics
  For hardness-dependent criteria where a calcium (Ca) or magnesium (Mg) value is missing and the hardness cannot be calculated, a hardness value reported from the laboratory will be used. If a hardness value cannot be calculated from a Ca and Mg value and the laboratory did not provide a hardness value, the unpaired records will be removed from assessment (exceptions to this policy are noted below).

- Aluminum, chronic only
  If either a field pH or calculated or lab hardness is missing, the aluminum, acute default value of 750 ug/l provided in Table 2.14.2 of R317-2 will be applied. Otherwise, the following pH and hardness combination and numeric criteria are applied:

  - pH ≥ 7.0 and (calculated or lab reported) Hardness ≥ 50 ppm: 750 ug/l
  - pH < 7.0 and (calculated or lab reported) Hardness ≥ 50 ppm: 87 ug/l
  - pH ≥ 7.0 and (calculated or lab reported) Hardness < 50 ppm: 87 ug/l
  - pH < 7.0 and (calculated or lab reported) Hardness < 50 ppm: 87 ug/l

- Ammonia, chronic
  DWQ assumes Fish Early Life Stages are present at all monitoring locations and the following equation is used:

$$((0.0577/(1+10^{7.688-pH})) + (2.487/(1+ 10^{pH-7.688}))) * MIN (2.85, 1.45*10^{0.028*(25-T)})$$

Where $(1.45*10^{0.028*(25-T)})$ is ≤ 2.85, $(1.45*10^{0.028*(25-T)})$ is applied and if $(1.45*10^{0.028*(25-T)})$ is > 2.85, 2.85 is applied. However, if a field pH or temperature reading is unavailable, a correction factor cannot be made and the result value for ammonia will be removed from the assessment.

- Ammonia, acute
  If a field pH is missing, a correction factor cannot be made and the result value for ammonia will be removed from assessment.

- Fluoride
  Currently UAC R317.2 provides a range of criteria for fluoride depending on air temperature. This sliding criterion was determined to be inappropriately applied. A single default value of 4.0 mg/l will be applied. This value is based on guidance from EPA on **National Primary Drinking Water Regulations**. Future revisions of the UAC R317.5 will reflect this change in water quality criteria for fluoride.

- Hydrogen Sulfide
  DWQ has discovered that the formula in UAC R317-2 used to convert dissolved sulfide to un-disassociated hydrogen sulfide is not correct. This formula will be updated in the future by DWQ's Standards program. Until the equation and/or criteria are reviewed and corrected by DWQ's Standard's program and Triennial Review work group and DWQ's board, all hydrogen sulfide assessments will be placed in a 3D Category.

Assessment Process

Once chronic and acute criteria are calculated, where applicable, toxicant sampling results are compared to the criteria to determine if the monitoring location is supporting designated uses or is impaired due to exceedances of the standard. Sites with two or more exceedances of the acute and/or chronic criteria will result in nonattainment of the beneficial use (no minimum sample size requirements). For sites to be attaining beneficial uses, four or more samples will be required with one or zero samples exceeding acute or chronic criteria. In cases where there are less than four samples and one or zero samples are exceeding the acute or chronic criteria, sites will be placed in 3A or 3E categories (Fig. 9).

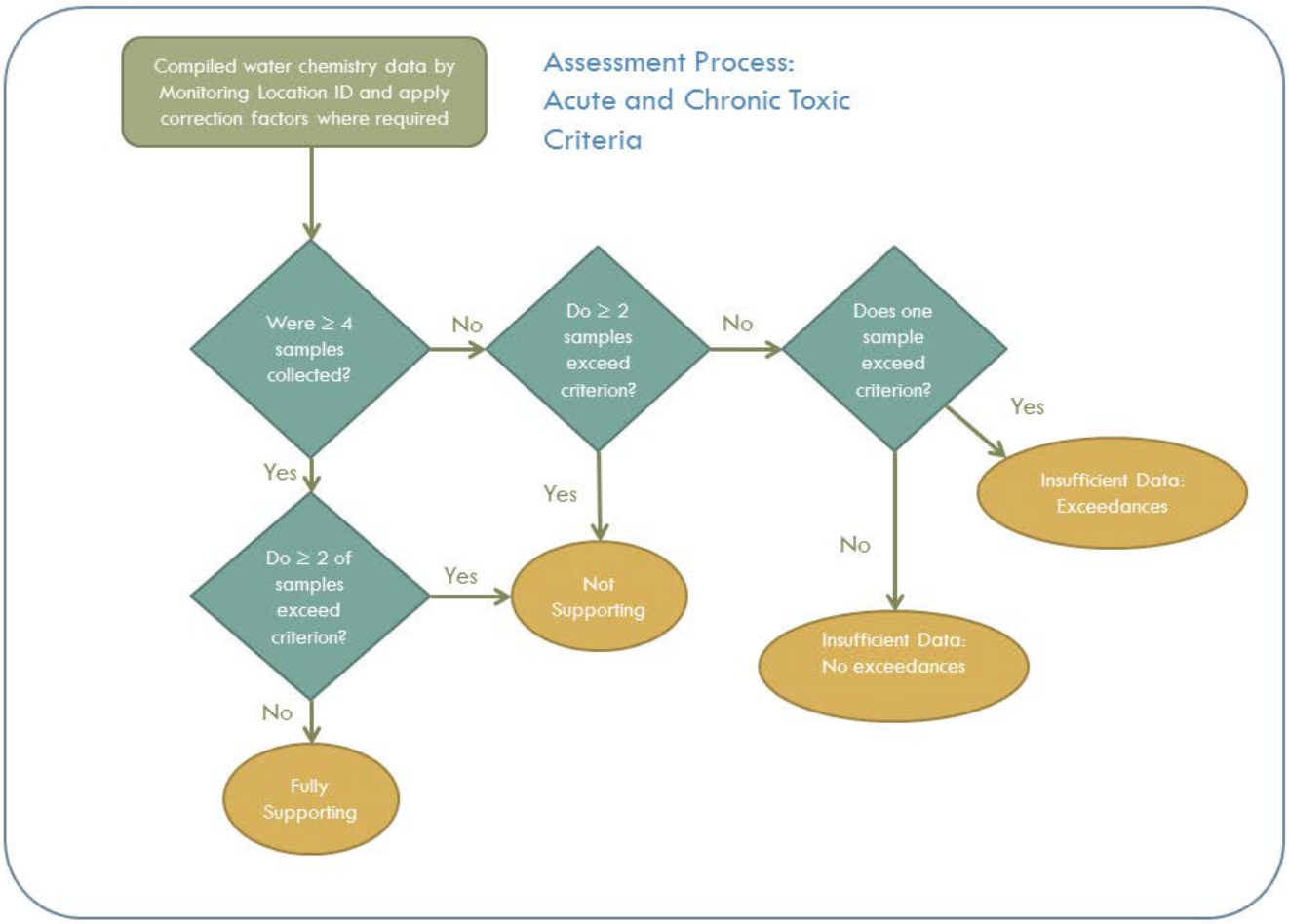


Figure 9. Overview of the Assessment Process for Toxic Parameters

Biological Assessments

Utah's beneficial uses for aquatic life require the protection of fish (cold water or warm water species) and the organisms on which they depend (UAC R317-2-6.3). Historically, DWQ assessed these beneficial uses via water chemistry sampling and associated standards that are protective of aquatic organisms. More recently, DWQ has developed an empirical model that directly assesses attainment of aquatic-life uses by quantifying the health of macroinvertebrate assemblages. Measuring biological communities directly has the advantage of integrating the combined effects of all pollutants, which allows a direct examination of how pollutants are interacting to affect the condition of a stream ecosystem (Karr, 1981). Moreover, because aquatic macroinvertebrates spend most of their life in aqueous environments, they are capable of integrating the effects of stressors over time, providing a measure of past and transient conditions (Karr and Dudley, 1981).

Biological assessments are often conducted by comparing the biological assemblage observed at a site with the expected biological assemblage in the absence of human-caused disturbance. Ideally, these comparisons are made using historical data to measure changes to the current biological community. However, in most cases, historical data are not available. As a result, biological conditions representing an absence of human-caused stress are typically set using reference sites as controls, or benchmarks, to establish the biological condition expected in the absence of human-caused disturbance. The biological integrity of sites can be

evaluated by comparing the biological composition observed at a site against a subset of physically similar reference sites. Collectively, such comparisons are referred to as biological assessments.

In aquatic biological assessments, reference sites are selected to represent the best available condition for streams with similar physical and geographical characteristics (Hughes et al., 1986, Suplee et al., 2005; Western Center for Monitoring and Assessment of Freshwater Ecosystems website). When reference sites are selected for water quality programs, conditions vary regionally depending on adjacent historical land use. For example, reference sites in Utah mountains are generally more pristine than in valleys. As a result, there are more biological benchmarks in areas of the state that receive less human-made disturbance than those with more disturbances.

A numeric index is a useful tool that quantifies the biological integrity, or biological beneficial use, of stream and river segments. Data obtained from biological collections are complex, with hundreds of species found throughout Utah that vary both spatially and temporally. Similarly, the physical template on which biota depend also varies considerably across streams. A robust index of biological integrity should simultaneously account for naturally occurring physical and biological variability and summarize these conditions through a single, easily interpretable number.

River Invertebrate Prediction and Classification System Models

DWQ uses the River Invertebrate Prediction and Classification System (RIVPACS) model approach to quantify biological integrity (Wright, 1995). RIVPACS is a classification of freshwater sites based on macroinvertebrate fauna. It was first derived in 1977 and has subsequently been used in numerous biological assessment programs worldwide. In the early 1970s, scientists and water managers recognized a need to understand the links between the ecology of running waters and macroinvertebrate communities. This began some of the very early biological assessment work in Europe. A four-year project was initiated to create a biological classification of unpolluted running waters in Great Britain based on the macroinvertebrate fauna (Furse et al., 1984; Wright, 1995; Clarke et al., 1996; Moss et al., 1999).

Over the past 30 years, equivalent RIVPACS models have been developed for aquatic ecosystems throughout the world, including Australia (Metzeling et al., 2002; Marchant and Hehir, 2002; Davies et al., 2000) and Indonesia (Sudaryanti et al., 2001). In the United States, scientists have developed RIVPACS models to assess the biological integrity of the country's aquatic habitats (Hawkins et al., 2000, Hawkins and Carlisle, 2001). Recently, many western states have adapted the RIVPACS model to determine beneficial uses of aquatic life in the rivers of state's such as Colorado (Paul et al., 2005), Montana (Feldman, 2006; Jessup et al., 2006), and Wyoming (Hargett et al., 2005).

To quantify biological condition, RIVPACS models compare the list of taxa (the lowest practical taxonomic resolution to which taxonomic groups are identified) that are observed (O) at a site to the list of taxa expected (E) in the absence of human-caused stress. Predictions of E are obtained empirically from reference sites that together are assumed to encompass the range of ecological variability observed among streams in the region where the model was developed. In practice, these data are expressed as the ratio O/E, the index of biological integrity (Fig. 10).

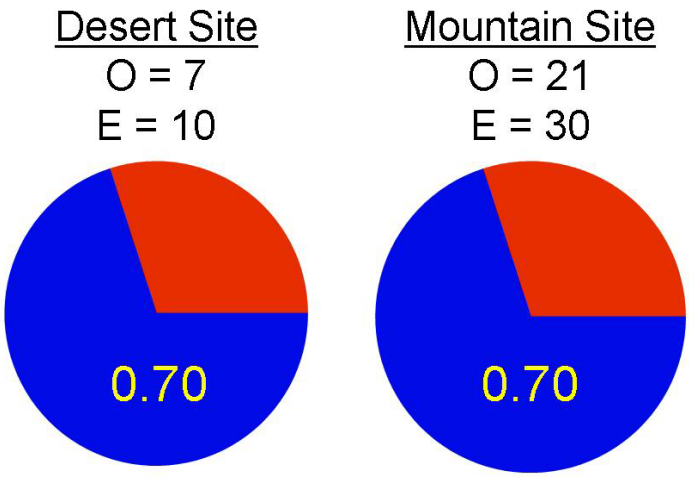


Figure 10. A hypothetical example of O/E as a standardization of biological assessments

Interpretation of RIVPACS models requires an understanding of the O/E ratio. In practice, O/E quantifies loss of predicted taxa. However, it is not a measure of raw taxa richness because O is constrained to include only those taxa that the model predicted to occur at a site. The fact that O/E only measures losses of native taxa is an important distinction, because the stream ecological template changes in response to disturbance, and taxa richness can actually increase as conditions become more advantageous to taxa that are more tolerant of the degraded condition. Despite the mathematical complexities of model development, O/E is easily interpreted because it simply represents the extent to which taxa have become locally extinct as a result of human activities. For example, an O/E ratio of 0.40 implies that, on average, 60 percent of the taxa have become locally extinct as a result of human-caused alterations to the stream.

O/E has some very useful properties as an index of biological condition. First, it has an intuitive biological meaning. Species diversity is considered the ecological capital on which ecosystem processes depend; therefore, O/E can be easily interpreted by researchers, managers, policy-makers, and the public. Second, O/E is universally spatial, which allows direct and meaningful comparison throughout the state. This is particularly important for Utah, where streams vary considerably from high-altitude mountain environments to the arid desert regions of the state. Third, its derivation and interpretation do not require knowledge of stressors in the region; it is simply a biological measuring tool. Finally, the value of O/E provides a quantitative measure of biological condition.

Model Construction and Performance

Construction of a RIVPACS model for Utah began in 2002, which involved developing and evaluating dozens of models. Details of model development procedures can be found elsewhere (Wright et al., 1993; Wright 1995; Clarke et al., 1996; Moss et al. 1999). Additionally, specific detailed instructions can be viewed on the Western Center for Monitoring and Assessment of Freshwater Ecosystems website and the EPA website. A brief summary is provided here to help the reader better understand Utah's model results and subsequent assessments.

As mentioned earlier, predictions of expected "E" taxa are obtained empirically from reference-site collections made throughout Utah. Reference sites are those that represent the reference conditions in different

biogeographical settings throughout Utah. The initial list of candidate reference sites is independently ranked by different scientists familiar with the streams. Only reference sites with a consensus representing best available conditions are used in model development. Subsequent reference sites are added using scores from reference scoring metrics developed during site visits and averaging with independent rankings from field scientists.

Some of the calculations involved in obtaining the list of expected taxa are complex. A heuristic description of the steps involved in predicting "E" provides some context of the assessment methodology. The first step in model development is to classify reference sites into groups of sites with similar taxonomic composition using a cluster analysis. Next, models are developed based on watershed descriptors such as climatic setting, soil characteristics, and stream size to generate equations that predict the probability of a new site falling within each group of reference sites. These equations account for environmental heterogeneity and ensure that when a new site is assessed, it is compared against ecologically similar reference sites. When a new site is assessed, predictions of group membership are then coupled to the distributions of taxa across groups of reference sites to estimate the probability of capturing (Pc) each taxon from the regional pool of all taxa found across all reference sites. E is then calculated as the sum of all taxa Pcs that had a greater than 50 percent chance of occurring at a site given the site's specific environmental characteristics. Using a Pc limit set at greater than 50 percent typically results in models that are more sensitive and precise, which results in a better ability to detect biological stress (Hawkins et al., 2000; Simpson and Norris 2000).

The accuracy and precision of RIVPACS models depend in part on the ability of the models to discriminate among groups of biologically similar reference sites. An extensive list of 74 GIS-based watershed descriptors is evaluated for potential predictor variables in models that predict the probability of membership within biological groups for sites not used in model construction. GIS-based predictor variables, such as soils, meteorology, and geography, instead of field-derived descriptors, are evaluated for a couple of reasons. First, GIS-based descriptors are unlikely to be influenced by human disturbance and are therefore unlikely to bias estimates of expected conditions (Hawkins, 2004). Second, these predictors are easily obtained for any site that allows inclusion of additional macroinvertebrate samples collected by others. Various subsets of potential predictors are evaluated in an iterative, analytical process that explores different combinations of predictors able to explain the biological variability among reference sites. The current RIVPACs model used by DWQ includes six variables that resulted in the most precisely predictive model (Table 9).

Table 9. Final predictor variables used in model construction

General Category	Description
Geology	Weighted average percentage calcium content of geology in the watershed
Geography	Mean watershed elevation (meters) from National Elevation Dataset
Geography	Watershed area in square kilometers
Climate	Watershed average of the mean day of year (1–365) of the last freeze derived from the PRISM data
Climate	Watershed average of the annual minimum of the predicted mean monthly precipitation (millimeters) derived from the PRISM data
Climate	Watershed average of the annual mean of the predicted mean monthly air temperature derived from PRISM data

The RIVPACS model used for the 2016 assessments was reconstructed to accommodate broader spatial and temporal data. Models used earlier were limited to samples from streams ranging from second to fifth order and were collected during a 'fall' window of September–November. The updated model accepts data collected from first- to eighth-plus order rivers and streams with no limitations on season of collection. In addition, new predictor variables were tested, and new and updated reference site data were included. However, to include data collected from agencies using different taxonomic laboratories, the taxon levels required adjustment, which resulted in a more coarse resolution of taxonomy. However, the resulting model was capable of scoring nearly 1,500 samples collected across the state by various agencies.

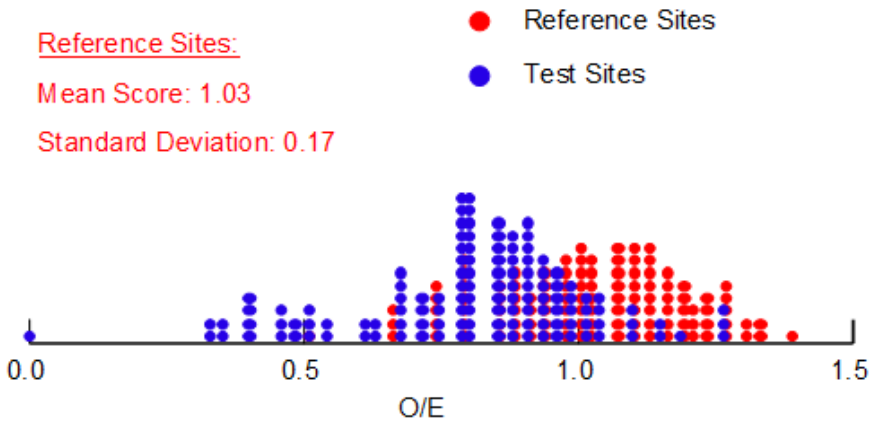


Figure 11. Distribution of Reference Site and Test Site O/E Scores.

The updated model is nearly as accurate and precise as previous models. If the model was perfectly accurate and precise, the O/E score for all reference sites would equal 1. Instead, reference O/E values are typically spread in a roughly normal distribution centered on 1 (Wright, 1995). Model precision is often expressed as the standard deviation (SD) of reference O/E values with lower SDs indicating higher model precision. The RIVPACS model to be used for the 2016 IR assessments has an SD of 0.19, which is within the range of "accepted" water quality models. The precision was likely affected by the more coarse resolution of taxonomy and the inclusion of a few large river sites as reference. The average reference O/E score for the current model is 1.03, which means that the model is slightly biased to generate higher O/E values than expected (Fig. 11). The accuracy of the model was evaluated by examining the distribution of reference O/E scores across environmental settings and determined that reference O/E values are not biased by stream size, elevation, or ecoregion.

Assessing Biological Use Support

DWQ does not have numeric biological criteria. However, DWQ has narrative biological criteria (**UAC R317-2-7.3**) that specify how quantitative model outputs are used to guide assessments. To make the narrative assessments as rigorous as possible, a systematic procedure was devised to use the RIVPACS model O/E values to determine aquatic life beneficial use support (Fig.12).The goal of this assessment process is to characterize each AU as fully supporting or not supporting aquatic life beneficial uses.

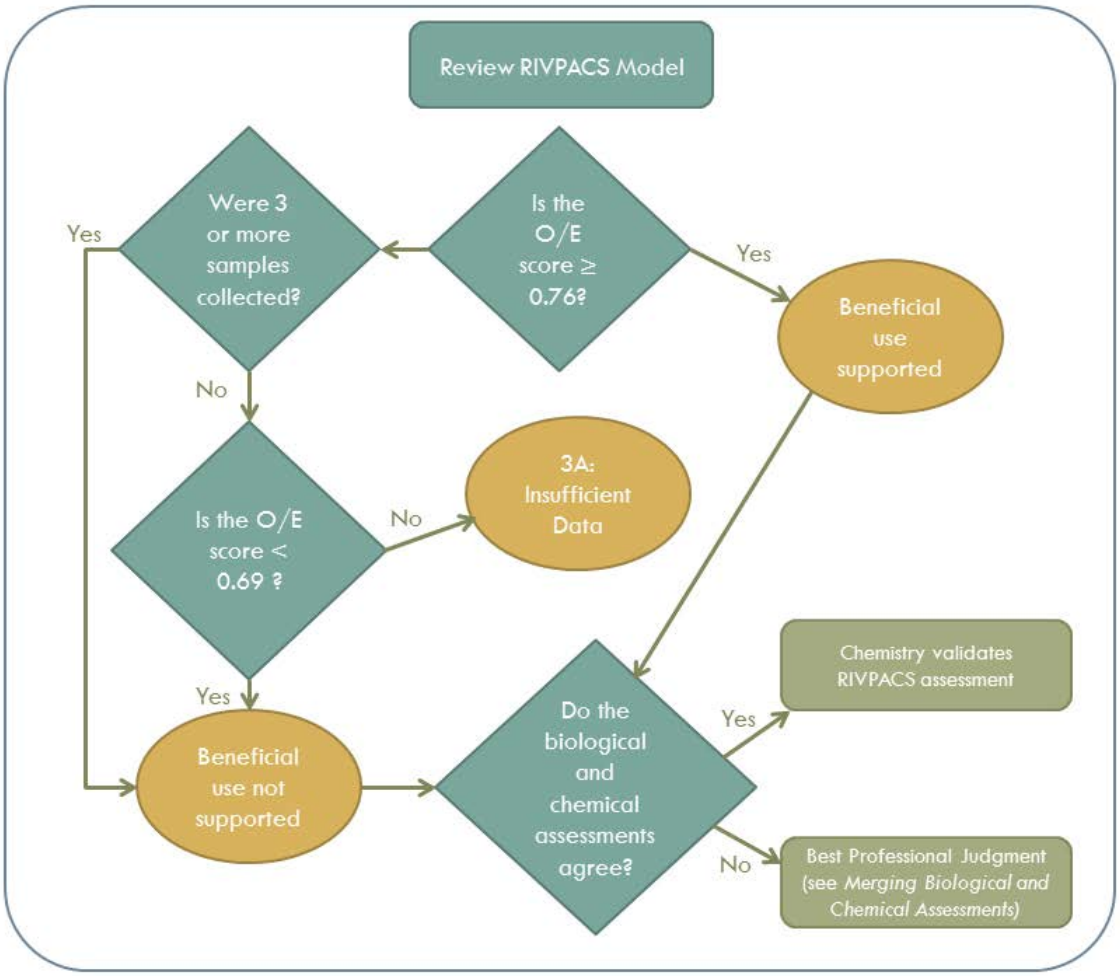


Figure 11. Flow Diagram Depicting the Decision Tree for Making Biological Assessment Decisions

Utah currently assesses watersheds based on established AUs. Although many AUs contain a single biological monitoring location, some AUs contain multiple sites. In such instances, DWQ staff examines available data to determine if multiple sites in an AU score similarly. When comparisons suggest that sites in one AU are ecologically similar, O/E scores from all sites in an AU are averaged for assessment purposes, provided that conclusions of biological condition are similar. If O/E scores differ appreciably among multiple sites in an AU, DWQ will investigate possible explanations for such discrepancies. If DWQ finds multiple sites within an AU from different environmental settings, AUs may be subdivided into smaller watershed units whenever clear boundaries can be identified (e.g., political/land use boundaries, tributary confluence). Additionally, if only one site is sampled in an AU, it is examined to determine whether it is an appropriate representation of the AU.

To translate the O/E values into assessment categories, it is necessary to devise impairment thresholds, or O/E scores that indicate whether or not a site is meeting biological beneficial uses (Table 10.). For these assessments, the 10th and 5th percentiles of reference sites were used. Essentially, the data used for the 2016 Assessment calculate the threshold based on 5th percentile at 0.69, whereas the 10th percentile is 0.76. These thresholds will provide the bounds according to sample strength. The data will be averaged across five years since the most recent sample was collected. Multiple years are preferred for assessments because O/E scores can vary from year to year and assessments are based on average conditions. Assessments based on the average condition of three or more samples reduces the probability of making an error of biological

beneficial-use support as a result of an unusual sampling event (e.g., following a flash flood, an improperly preserved sample).

Table 10. Beneficial Use Support Determination for O/E Values Obtained from Different Sample Sizes

Sample Size	O/E Threshold	Use Determination	Comments
≥ 1 sample collected over 5 years	Mean O/E score ≥ 0.76	Fully supporting	Threshold based on 10th percentile of reference sites
≥ 3 samples collected over 5 years	Mean O/E score < 0.76	Not supporting	Threshold based on 10th percentile of reference sites
< 3 samples	Mean O/E score ≥ 0.76	Fully supporting	Threshold based on 10th percentile of reference sites
< 3 samples	Mean O/E score ≥ 0.69–≤ 0.76	Category 3A (insufficient data)	Lower threshold based on 5th percentile of reference sites
< 3 samples	2 of 2 O/E scores < 0.69	Not supporting	Threshold based on 5th percentile of reference sites
< 3 samples	< 2 O/E scores < 0.69	Category 3A (insufficient data)	Threshold based on 5th percentile of reference sites

These errors can be costly to DWQ by increasing staff time and resources for follow-up assessments on erroneous assessments. AUs not meeting biological thresholds will be assessed as non-supporting, or they will be required for follow-up sampling if additional information is needed. Assessments of more than three samples with average O/E scores of greater than or equal to 0.76 have a low probability of being misclassified as nonsupport. Alternatively, assessments with fewer than three samples with an average O/E score of less than 0.69 have a five percent probability of being misclassified as nonsupport. To ensure that one sample was not incorrectly misapplied, at least two samples with a score of 0.69 or less will be required to consider an AU not meeting the aquatic life use. Assessments with fewer than three samples that have a mean O/E score of greater than or equal to 0.69 and less than 0.76 will be placed in impairment Category 3A, which indicates that there are insufficient data to make an assessment. All sites listed as 3A will be given a high priority for future biological monitoring.

ASSESSMENT OF LAKES AND RESERVOIRS

Lakes and reservoirs are defined in UAC R317-2-13.12 by county along with the designated beneficial uses for which they are protected. Waterbodies not specifically listed are assigned beneficial uses by default to the classification(s) of the tributary stream(s). Other than the Great Salt Lake, each waterbody has been assigned an Assessment Unit (AU) for purposes of assessment. In UAC R317-2-14, numeric water quality criteria for both toxic and conventional parameters are assigned for each designated use. Deeper lakes naturally stratify thermally which will affect how conventional water quality parameters are assessed (UAC R317-2-14). Therefore, each waterbody will be evaluated for thermal stratification and assessed appropriately.

Monitoring Overview

DWQ has identified 137 lakes based on size and public interest to receive consistent, programmatic monitoring. These waterbodies account for 93 percent of the water surface acres in Utah. Additional lakes are targeted for monitoring to ensure public health due to potential harmful algal blooms. Waters that are high recreational use or protected for drinking water are prioritized. DWQ transitioned to a rotating basin (n=6) approach where monitoring is focused in a basin through sampling. Lakes within the focused basin are sampled once during the year, typically May-September. Waterbodies deemed high-priority (Category 3A, 5), will be sampled more frequently per year regardless of their location. For most lakes, the change to a basin-intensive approach results in collecting a single sample every six years, which necessitated changes to the assessment methodology. The 2016 assessments are based on the last six years of data (for instance, the 2016 data used data from 2009 -2014). If data for this time period were unavailable, data from the previous four years (total of 12 years) were assessed. DWQ also participates in the National Lake Assessment (NLA) component of the National Aquatic Surveys conducted every five years by EPA. For these surveys, Utah adopts a state-intensification approach where 50 probability-based sites are selected within the state using the NLA design. Data that are compatible with DWQ's lake assessment methods are also used for determining beneficial-use support.

Field Method Overview

For the majority of waterbodies, data collection occurs in the deepest location of the lake. Although some waterbodies have multiple locations where data are collected, data used for assessments rely on, but are not limited to, samples collected from the location with the deepest depth. Water column profile data are collected at the surface and at every meter of the water column depth. The collection is completed when the probe is one meter above the bottom. Surface samples are collected from a depth of 0.5 meter. All water chemistry samples, except dissolved metals and algae, are collected at the surface, one meter above the thermocline, one meter below the thermocline, and near the bottom. The dissolved metals sample is collected one meter above the bottom at the deepest site of the waterbody. The algal sample, which is analyzed for taxonomic composition and primary production (chlorophyll a), is collected as a composite sample from two times the depth of the Secchi disc reading to the surface up to a maximum of two meters.

The assessment of Utah lakes consists of two tiers:

- Tier I assessment is the preliminary determination of support status for Recreational Use, Aquatic Life, and Agricultural classes based on conventional parameters, such as dissolved oxygen (DO), temperature, pH, toxicants, *E. coli*, etc. For instances when Tier I data are unavailable, DWQ may rely upon Tier II data to make an initial assessment. When considering Aquatic Life Use attainment within this Tier, the waterbody will be classified as mixed or stratified based on the depth profile information. If it is a stratified waterbody, the evaluation of conventional parameters will follow the

protocol designed to evaluate the sufficiency of aquatic life habitat. If the waterbody is mixed, it will follow the assessment protocol that evaluates the entire depth profile.

- Tier II assessment looks further into the weighted evidence criteria (Trophic State Index (TSI), fish kills, and algal composition) using Best Professional Judgment (BPJ). The Tier I preliminary support status may be modified through an evaluation of the TSI, water-quality-related fish kills, and the composition and abundance of blue-green algae. The Tier II evaluation could adjust the preliminary support status ranking if at least two of the three criteria indicate a different support status.

DWQ will prioritize waterbodies that are assessed as Category 3A for subsequent monitoring so that conclusive beneficial use assessments can be made.

Tier I Assessments

Drinking Water Use Support

Assessing for Drinking Water Use support involves evaluations of *E. coli*, harmful algal blooms, pH, and metals. *E. coli* is collected at waterbodies designated for the Drinking Water Use. Review the *E. coli* assessment methods section discussed earlier in this chapter for further information. The evaluation process of pH and metals is the same as the requirements for Aquatic Life Uses (other than criteria thresholds) which are described below.

HARMFUL ALGAL BLOOMS

DWQ is actively developing a monitoring and reporting program for harmful algal blooms. In the interim, DWQ will use the recommendations by the World Health Organization to guide this assessment. These recommendations prescribe human health risks associated with aggregated cyanobacteria cell counts (Table 11). Excessive growth of cyanobacteria can lead to taste and odor problems, which increases drinking water treatments costs. In some instances, sources of drinking water may need to be temporarily excluded from the water supply until a cyanobacteria bloom subsides. Some species of cyanobacteria, particularly *Anabaena* sp., *Aphanizomenon* sp., *Microcystis* sp., and *Planktothorix* sp., can produce cyanotoxins that are harmful to people and other animals. Currently, DWQ prioritizes monitoring for harmful algal blooms in waters designated for drinking water and those waters that experience significant recreational usage, such as motor boating, water skiing and swimming. This monitoring will be in partnership with the Division of Drinking Water and Division of State Parks, as resources allow. Data and assessments will be shared with the Department of Health and Local Health Departments.

Beneficial Use Supported

The beneficial use is supported if cyanobacteria cell counts <20,000 cells/L.

Beneficial Use Not Supported

The beneficial use is categorized as "Threatened" if the cyanobacteria cell count exceeds 100,000 cells/L once for waters that have Drinking Water Use (1C) designation.

The beneficial use is not supported if the cyanobacteria cell count exceeds 100,000 cells/L for more than one sampling event for waters that have Drinking Water Use (1C) designation.

Insufficient Data and Information

The waterbody will be categorized 3A if there is one exceedance >20,000 cells/L. These waterbodies will be prioritized for further evaluation with respective public health managing partners such as the State Health Department, respective drinking water agencies, and State Parks Departments.

Table 11. World Health Organization Thresholds of Human Health Risk Associated with Potential Exposure to Cyanotoxins

Indicator (units)	Low Risk	Moderate Risk	High Risk
Chl-a (ug/L)	<10	10-50	>50
Cyanobacteria cell counts (cells/L)	<20,000	20,000-100,000	>100,000

Recreational Use Support Assessment

Assessing for Recreational Use support involves evaluations of pH, *E. coli*, and harmful algal blooms. The evaluation of pH is the same as the requirements for Aquatic Life Uses which are described in that section below. The methods for assessing the remaining indicators are described below.

ESCHERICHIA COLI (E. COLI)

E. coli is collected at select waterbodies to ensure the protection of Recreational Uses. Review the *E. coli* assessment methods section for further information.

HARMFUL ALGAL BLOOMS

People's health can be put at risk when exposed to algal toxins through skin contact, inhalation, or ingestion. This exposure pathway exists through multiple methods of recreation in lakes such as boating, skiing, and swimming. DWQ is working with partner agencies to develop a monitoring, evaluation, notification, and mitigation strategy to address the public's potential exposure to these toxins.

Beneficial Use Supported

The beneficial use is supported if cyanobacteria cell counts <20,000 cells/L.

Beneficial Use Not Supported

The beneficial use is not supported if the cyanobacteria cell count exceeds 100,000 cells/L for more than one sampling event and/or other narrative indicators suggesting an impairment of recreational uses.

Insufficient Data and Information

The waterbody will be categorized 3A if there is one exceedance >20,000 cells/L. These waterbodies will be prioritized for further evaluation with respective public health managing partners such as the State Health Department and State Parks Departments.

Aquatic Life Use Support

Lake monitoring routinely involves collecting pH, temperature, and DO measurements at one-meter intervals throughout the water column, from the surface to the lake bottom. If more than one site is sampled, the profile measurements collected at the deepest location of the waterbody are used for assessment calculations, unless there is sufficient reason to use profile data from other locations on the lake. These water-column measurements are compared against Utah water quality standards to assess beneficial use support (Fig.12). For waterbodies that are thermally stratified, a separate process is used to determine whether sufficient habitat is available for aquatic life (Fig. 16).

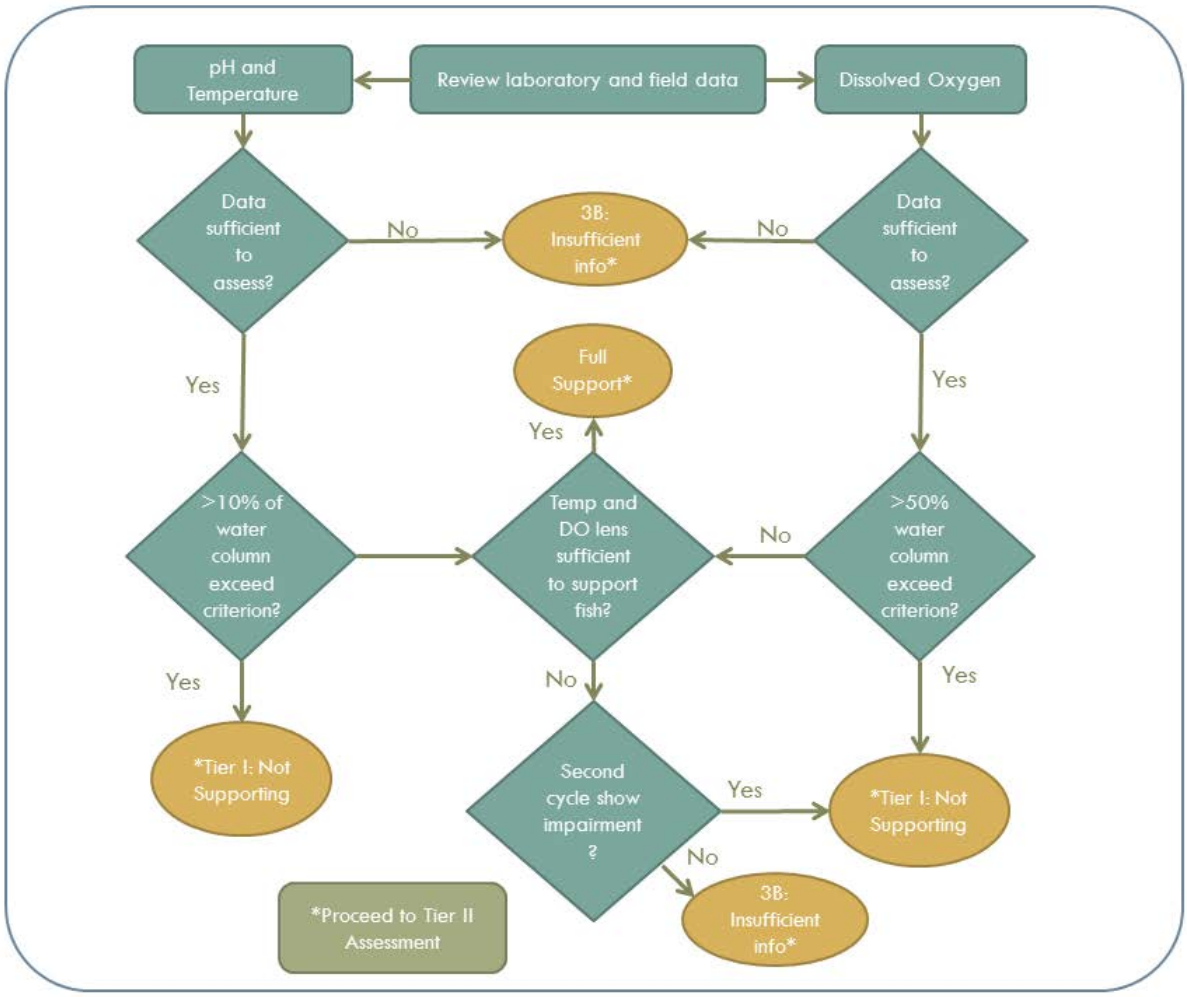


Figure 12. Process Using Conventional (Nontoxic) Parameters to Assess Lakes that Are Mixed

For stratified waterbodies, an alternative test is used to evaluate whether aquatic life have sufficient habitat (see Fig. 12). In all cases, these assessments are followed by a second, Tier II, assessment process.

PH

Two pH criteria, maximum (9.0) and minimum (6.5), are used to assess support of beneficial uses:

Beneficial Use Supported

The beneficial use is supported if the number of violations are less than or equal to 10% of the measurements (e.g., Figure 13, Panel A).

Beneficial Use Not Supported

The beneficial use is not supported if greater than 10% of the measurements (minimum of two discrete measures outside thresholds) violate the pH criterion (e.g., Figure 13, Panel B).

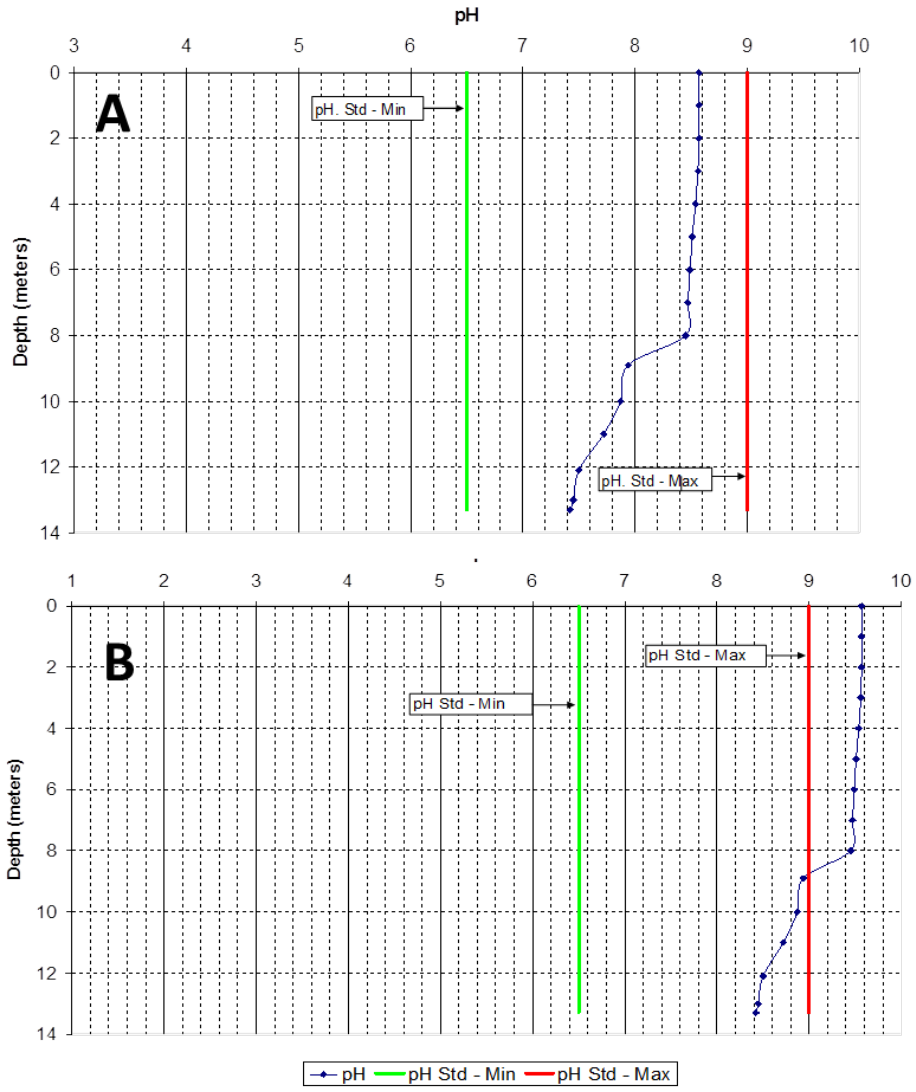


Figure 13. Plots of pH measurements (blue dots) against lake depth for a waterbody meeting (Panel A) and violating (Panel B) the pH water quality standards.

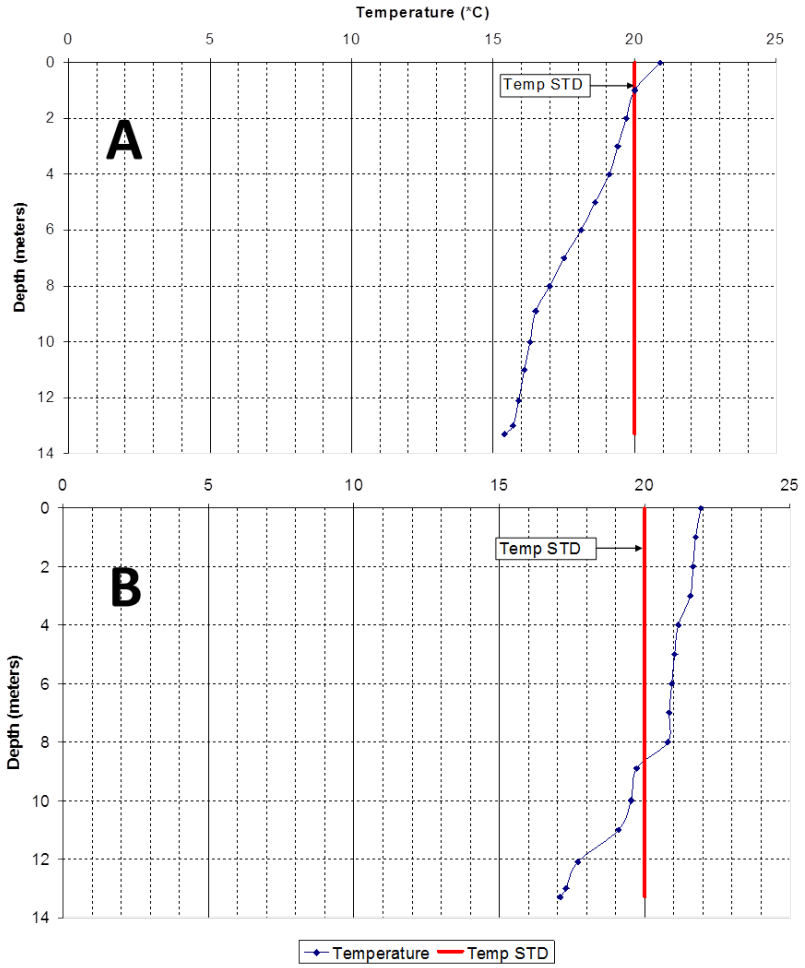


Figure 14. Plots of temperature measurements (blue dots) against lake depth for two waterbodies to provide an example of assessment procedures.

Notes: The red line illustrates a temperature criterion of 20 degrees Celsius—Class 3A beneficial use. Panel A (top) illustrates a waterbody meeting the beneficial use because less than 10% of the temperature measures are greater than the criterion, whereas Panel B (bottom) illustrates a waterbody not meeting the beneficial use because greater than 10% of the temperature measures exceed the criterion.

TEMPERATURE

The temperature assessment uses the criterion of 20 degrees Celsius for Class 3A waters and 27 degrees Celsius for Class 3B and 3C waters. The criteria used to assess the beneficial-use support are based upon profile data. Data collected from the deepest location on the waterbody during the critical time period (May-September) are used to calculate the percentage of violations for each sampling date. If the temperature criterion is exceeded in more than 10 percent of the measurements with a minimum of two discrete measures exceeding criteria from any individual sampling event, the waterbody is not supporting the aquatic life uses.

Beneficial Use Fully Supported

The beneficial use is supported if the number of violations is less than or equal to 10 percent of the measurements (see Fig.14, Panel A).

Beneficial Use Not Supported

The beneficial use is not supported if more than 10 percent of the measurements violate the temperature standard (see Fig. 14, Panel B).

DISSOLVED OXYGEN

Like the temperature assessment, the DO assessment uses data that are gathered from the lake profile The DO assessment uses the minimum criterion of 4.0 mg/L for Class 3A waters and 3.0 mg/L for Class 3B and 3C waters (UAC R317-2-14, Table 2.14.2). State standards account for anoxic or low DO conditions that may exist in the bottoms of deep waterbodies (UAC R317-2-14). For that reason, DO measures in deep, stratified waterbodies used in the assessment are limited to the layer above the thermocline. See the next section for further explanation of this method.

Beneficial Use Supported

The beneficial use is supported if at least 90 percent of the oxygen measurements are greater than the standard.

Beneficial Use Not Supported

The beneficial use is not supported if greater than 10 percent of the oxygen measurements are below the DO standard during any single sampling event.

Aquatic Life Use Assessment for Stratified Lakes and Reservoirs

For those lakes that are thermally stratified, a separate assessment technique is needed to ensure sufficient habitat exists. If a lake profile indicates that the aquatic habitat is reduced by high temperatures or limited DO in the water column, an assessment is conducted to determine if there is sufficient habitat for aquatic life (see Fig. 11). Habitat is considered sufficient if the metalimnion (area between the lower and upper portions of the lake) and at least three meters of the waterbody is meeting the criteria for both temperature and dissolved oxygen. The only exception to this rule is if, after consulting with the Division of Wildlife Resources, that the waterbody is meeting the requirements of a healthy fishery and is not limited due to poor water quality. For waterbodies that are subject to human-controlled operations or instances where severe drought has been documented (e.g., Palmer Drought Severity Index), water levels are taken into consideration. Water levels can change from year to year based on the spring runoff and how full the waterbody was at the end of the previous irrigation season or how much water was needed for culinary purposes. Figure 17 provides an example of supporting and not supporting the beneficial use based on the DO and temperature data above the thermocline. The rationale for a conclusion of beneficial-use support based on the existence of adequate habitat follows the decision diagram (Fig. 15).

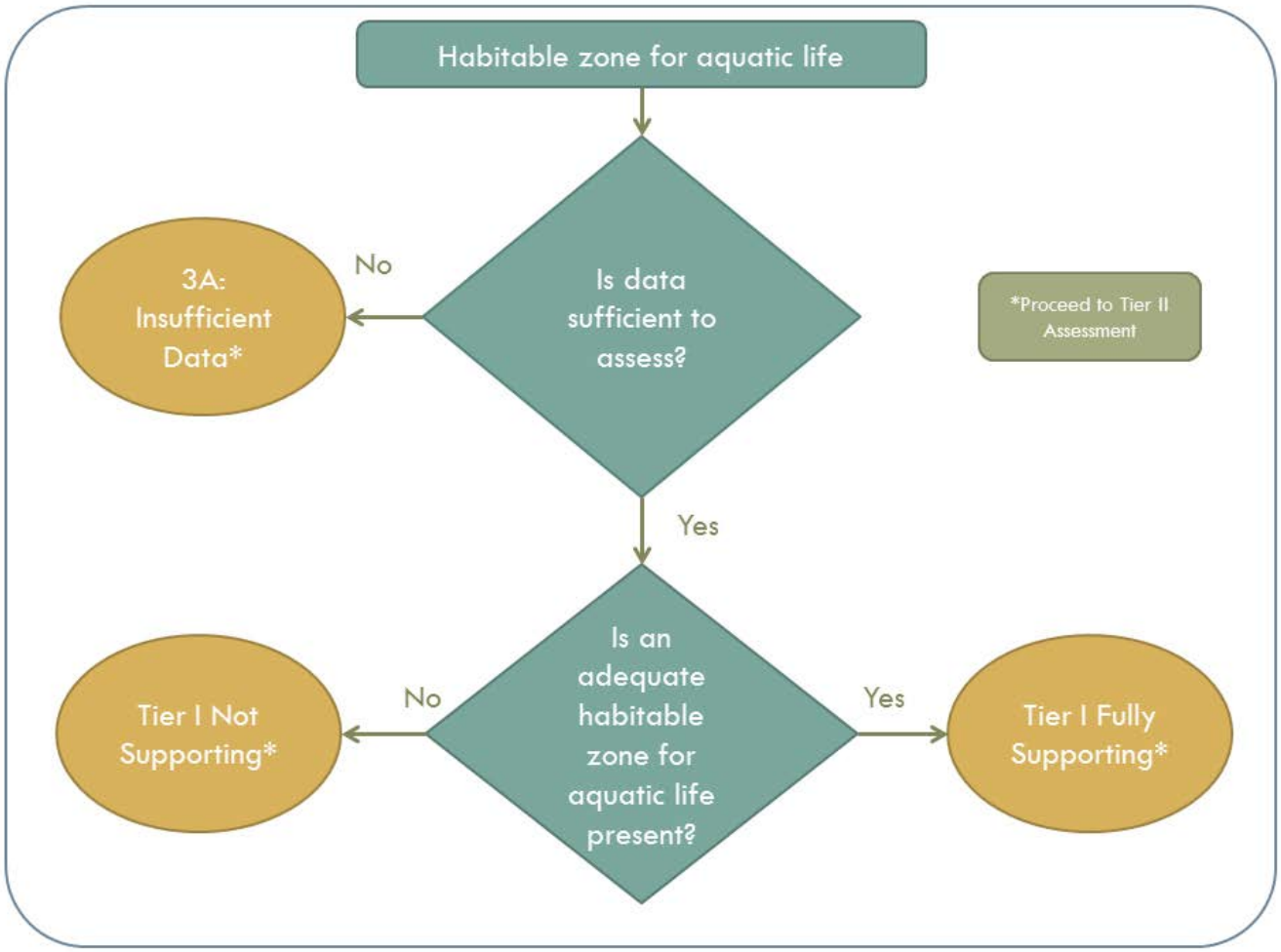


Figure 15. Beneficial-Use Support Based on the Existence of Adequate Habitat

Beneficial Use Supported
The beneficial use is supported if there is sufficient habitat, defined as based on DO and temperature profile.

Beneficial Use Not Supported
The beneficial use is not supported if there is insufficient habitat for aquatic life based on DO and temperature profile.

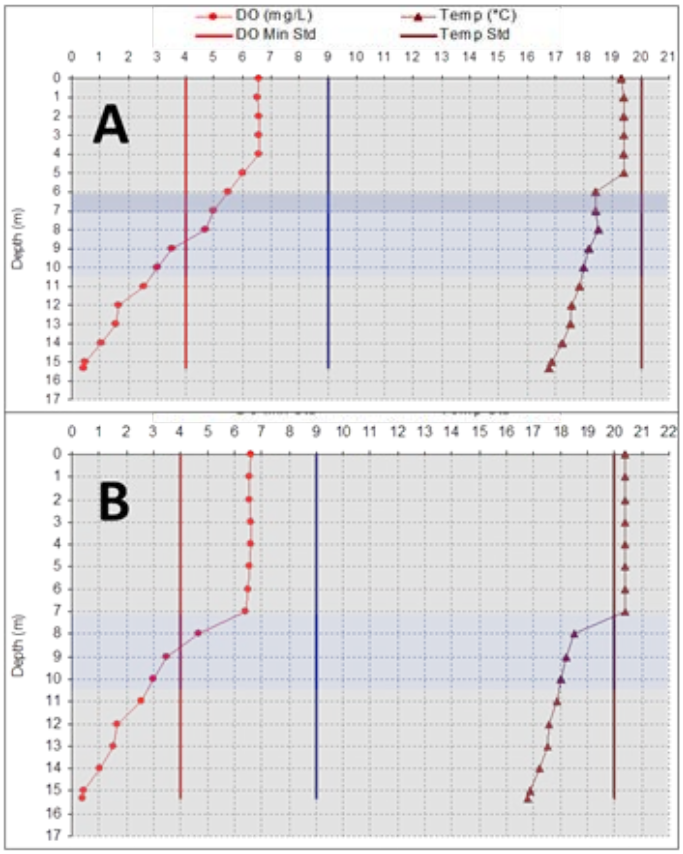


Figure 16. These images illustrate the concept of the habitable zone where both DO and temperature are suitable for aquatic life. The waterbody depicted on the top (Panel A) would be considered supporting because the lens where both temperature and DO provide sufficient habitat. Conversely, the lake on the bottom is not meeting aquatic life uses because the habitable zone is minimal.

Toxics: Dissolved Metals

To obtain dissolved metals data, one sample is collected near the bottom at the deepest point in the waterbody. The sample is obtained here because this area generally has the highest dissolved metal concentrations.

Insufficient Data and Information

If the concentration of these pollutants exceeds the criteria, the waterbody is categorized 3A and DWQ will return to the site to conduct sampling the following year. In other words, due to the potentially toxic nature of these contaminants, DWQ will not wait until the next rotating basin cycle before following up on these potential water quality problems.

Beneficial Use Supported

The beneficial use is supported if there are less than two exceedances of the chronic or acute standard across consecutive reporting cycles.

Beneficial Use Not Supported

The beneficial use is not supported if the concentration exceeds the chronic or acute standard two or more times across consecutive reporting cycles.

Agricultural Use Support

Total Dissolved Solids

The TDS criterion is 1,200 mg/L unless a site specific standard for the waterbody has been established. If TDS data are unavailable but conductivity data are available, the conductivity data are used to estimate TDS (USGS 2006). An exceedance using conductivity as a surrogate will result in a Category 3A listing, and the waterbody will be targeted for TDS sampling.

The following rules are used to determine whether a lake is supporting its agricultural beneficial use (Fig. 17):

Beneficial Use Supported
The beneficial use is supported if the standard is exceeded one or fewer times.

Beneficial Use Not Supported
The beneficial use is not supported if the TDS standard is exceeded more than one time.

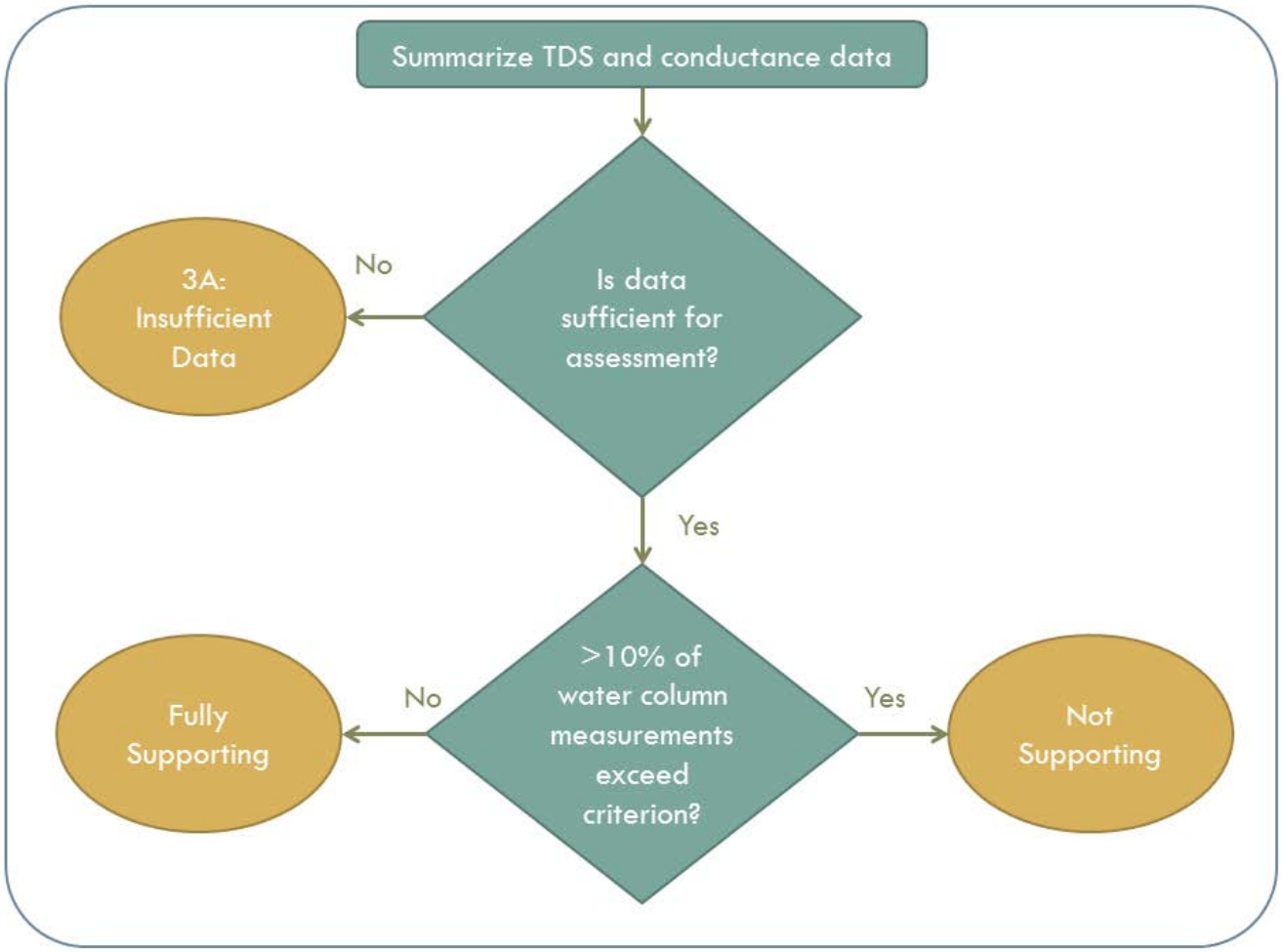


Figure 17. Assessment Process to Determine Support of the Agricultural Beneficial Use with TDS data

Tier II Assessments

Weighted Evidence Criteria

The weighted evidence criteria consist of the following three data types. These evaluations are based on data collected by DWQ and sometimes by outside agencies that follow DWQ procedures.

- Increasing TSI trend over the long-term period (~10 years) or a TSI-Chl-a greater than 50
- Water-quality-based fish kills or winter DO measures not meeting the criterion when measured
- Evaluation of phytoplankton community

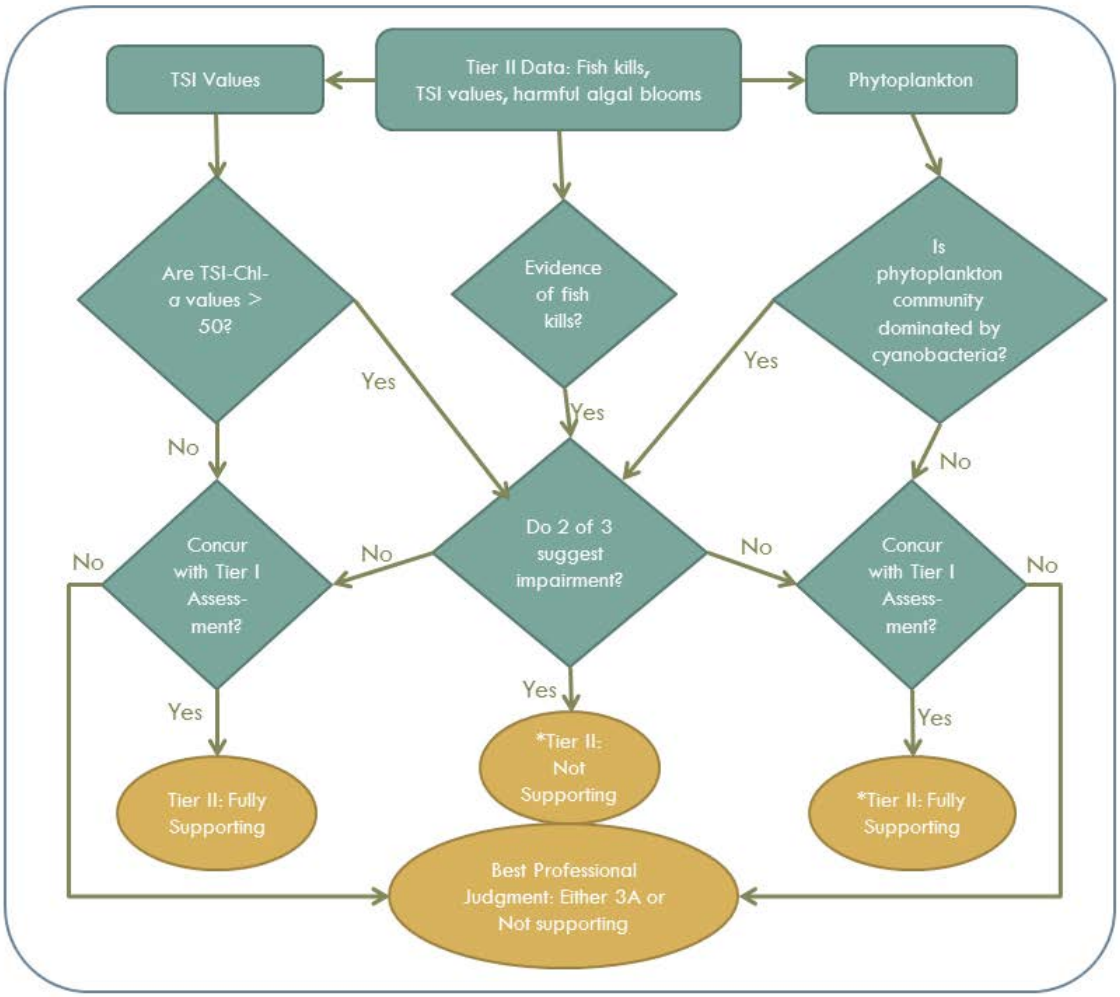


Figure 18. A Flow Chart that Describes the Tier II Assessment Process for Lakes

Note: These assessments allow DWQ to use key lines of evidence in making assessments that would be ignored by exclusively focusing on chemical water quality parameters.

Carlson's Trophic State Index

The Carlson's TSI is calculated using Secchi disk transparency, total phosphorus, and chlorophyll a. TSI value ranges from 0 to 100, with increasing values indicating a more eutrophic condition, as follows (Table 10).

Carlson's TSI estimates are calculated using the following equations:

- Trophic Status Based on Secchi Disk (TSI-SD)

TSI-SD = 60 - 14.41 ln (SD), where SD = Secchi disk transparency in meters

The abbreviation "ln" indicates the natural logarithm.

- Trophic Status Based on Total Phosphorus (TSI-TP)
  TSI-TP = 14.20 ln (TP) + 4.15, where TP = total phosphorus concentration in µg/L

- Trophic Status Based on Chlorophyll *a* (TSI-Chl-*a*)
  TSI-Chl-*a* = 9.81 ln (Chl-*a*) + 30.60, where TC = chlorophyll *a* concentrations in µg/L

Once calculated, these independent TSI indicators can be used to interpret how various factors interact to influence lake production (see Table 10). In each case, individual TSI values can also be used to generalize the overall trophic state of the lake as follows:

- TSI Index value less than 40: oligotrophic
- TSI Index value 40–50: mesotrophic
- TSI Index value 51–70: eutrophic
- TSI Index Value Greater than 70: Hypereutrophic

Table 10. Conditions Likely Limiting Production

Relationship Between TSIs	Conditions Limiting Algae Production
TSI (Chl-*a*) = TSI (SD) = TSI (TP)	**Algae conditions dominate light attenuation.**
TSI (Chl-*a*) > TSI (SD)	**Large particulates, such as *Aphanizomenon* flakes, dominate.**
TSI (TP) = TSI (SD) > TSI (Chl-*a*)	**Nonalgal particulates or color dominate light attenuation.**
TSI (SD) = TSI (Chl-*a*) > TSI (TP)	**Phosphorus limits algal biomass (TN/TP ratio greater than 33:1).**
TSI (TP) > TSI (Chl-*a*) = TSI (SD)	**Zooplankton grazing, nitrogen, or some factor other than phosphorus limits algal biomass.**

TSI's are calculated independently for each indicator (i.e., Secchi disk, chlorophyll *a* and total phosphorus) and are not averaged. The most reliable indicator of trophic status is chlorophyll *a* (TSI-Chl-*a*), followed by Secchi disk (TSI-SD), and total phosphorus (TSI-TP) (Carlson, 1977). In some lakes, the TSIs for each index are similar. For other lakes, large differences may be observed.

For this reporting cycle, the TSI (May through September) for each measure is reported. Large discrepancies between TSIs can be suggestive of specific lake conditions that may provide additional context for interpreting the TSI (Figure 19). If TSI has increased from past reporting cycles, DWQ will elevate the priority status of the waterbody for more frequent and urgent sampling. However, the weighted evidence (Figure 19) using TSI is activated when TSI-Chl-*a* values are > 50.

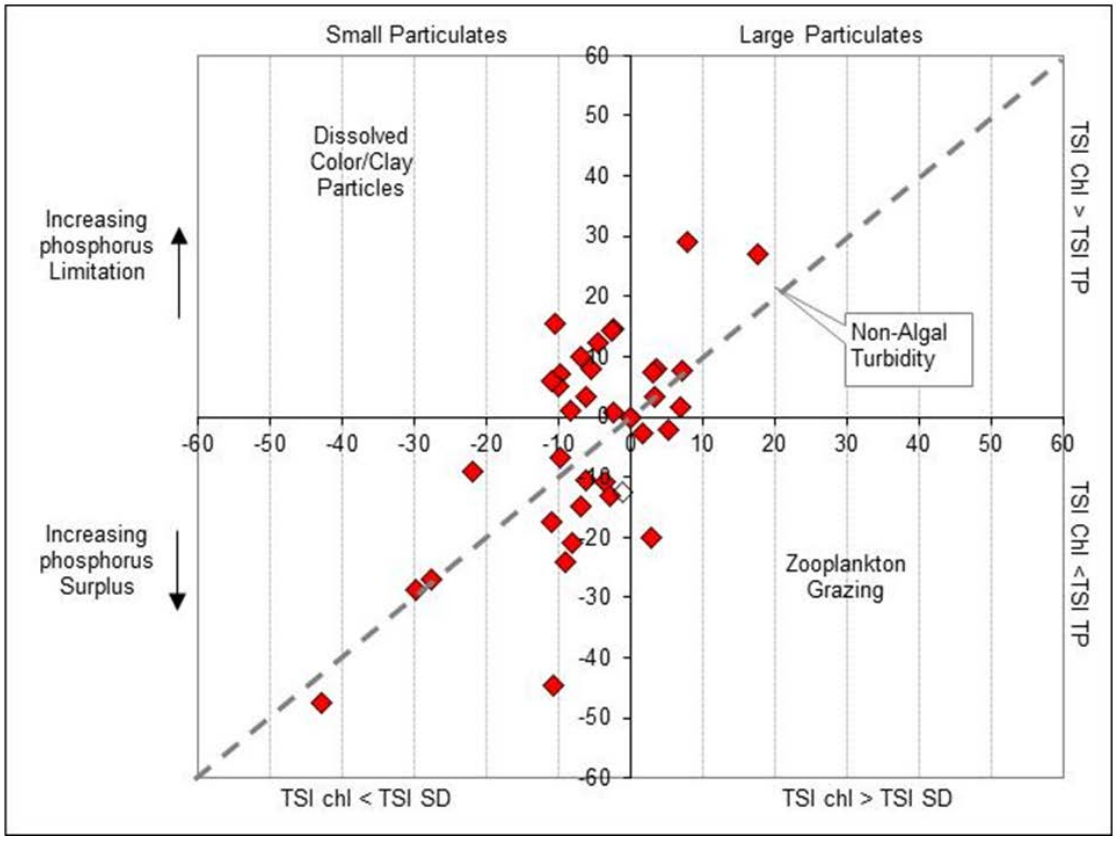


Figure 19. Plots of Chlorophyll A, Total Phosphorus , and Secchi Depth TSI values.

Fish Kill Observations

Fish kills can result from poor water quality, although not exclusively, and can provide an important line of evidence that a waterbody is not meeting the beneficial uses. To obtain this information, DWQ contacts regional biologists at Utah Division of Wildlife Resources to obtain fish-kill records and proposed rationale for death. However, reliable fish-kill data are not available for many waterbodies due to their remoteness.

Phytoplankton Community

DWQ routinely collects phytoplankton to evaluate the composition and relative abundance of algae and cyanobacteria. These data are used to determine if a waterbody is not meeting beneficial uses due to eutrophication and whether the public are at risk of exposure to toxins secreted by cyanobacteria. Phytoplankton (algal) data are used in the Tier II assessment process because they reflect nutrient availability and nutrient ratios. An observation that a waterbody has diverse and abundant diatoms relative to other algae or cyanobacteria taxa is used as a line of evidence that the waterbody is supporting its designated uses.

Table 11. Aquatic Life Use Parameter/Indicator by Beneficial Use Matrix Table

Indicators	Minimum Data Requirement	Exceedance Frequency	Threshold
Biological			
Chlorophyll a	One sample	Once	TSI-Chl-a >50
Conventional			
pH	One lake profile collected (multiple discrete samples)	>10 percent of discrete samples outside threshold bounds	Outside the range of 6.5-9.0
Temperature	One lake profile collected (multiple discrete samples)	>10 percent of discrete samples exceeding threshold	20 Celsius- 3A ALU 27 Celsius- 3B/3C ALU
DO	One lake profile collected (multiple discrete samples)	>10 percent of discrete samples (upper layer if stratified) exceeding threshold	4 mg/L – 3A ALU 3 mg/L – 3B/3C ALU
Aquatic Toxicity-based			
Acute toxicity	Two values across consecutive reporting cycles	Maximum daily concentration not exceeded more than once across two reporting cycles	See criteria in UAC R317-2-14-Table 2..14.2
Chronic toxicity	Two values across consecutive reporting cycles	Maximum daily concentration not exceeded more than once across two reporting cycles	See criteria in UAC R317-2-14-Table 2..14.2

Great Salt Lake

Great Salt Lake (GSL) is assigned its own beneficial use class (Class 5) and is further divided into five sub-classes (5A-5E) that represent the four main bays (Gilbert, Gunnison, Bear River and Farmington) and transitional waters (UAC R317-2-6). With the exception of a numeric selenium egg tissue standard for Class 5A - Gilbert Bay, no other numeric criteria are available to assess GSL. Instead, the beneficial uses of GSL are protected and assessed by the Narrative Standard (UAC R317-2-7.2). The Great Salt Lake Water Quality Strategy, finalized and endorsed by the Water Quality Board in 2014, outlines the process for the future development of numeric criteria for each of the lake's bays as well as monitoring and research.

DETERMINATION OF IMPAIRMENT: ALL ASSESSMENT UNITS

Following the initial assessment of credible data against the numeric criteria in UAC R317-2, each parameter within a waterbody is assigned a provisional EPA- and state-derived assessment category. To verify the parameter-specific assessment results and consolidate the often multiple parameter assessments into one result per waterbody, DWQ must consider the strength of the quantity of data and the extent to which such data demonstrates clear and convincing evidence of supporting or not supporting the beneficial uses assigned to the waterbody in UAC R317-2. In determining the strength of whether or not a waterbody is supporting or not supporting its beneficial uses, DWQ considers the following information:

- Individual assessment of water quality standards at a single site
- Multiple lines of evidence
- Independent applicability
- DWQ's narrative criterion, to make a final decision based on the overwhelming evidence,
- Several levels of best professional judgments (BPJ).

Individual Assessment of Water Quality Standards

In determining whether or not a waterbody or segment within a waterbody is supporting or not supporting the beneficial uses assigned in UAC R317-2, DWQ first considers the individual parameter-specific assessments results that were derived from the data assessment protocols described earlier in this document. Unless noted in the waterbody-specific data assessment protocols, the assessment policies outlined in this document provide a direct and quantifiable method and documentation of data supporting or not supporting DWQ's water quality standards versus data and information that are developed using surrogate parameters or indicators. Because individual assessments at a single monitoring location site offer a more direct measure of supporting or not supporting water quality standards in UAC R317-2, DWQ places a greater weight on individual assessment decisions that follow the data assessment protocols in this document.

Conflicting Assessments of Water Quality Standards

Following the review of the individual water quality standard assessments, DWQ looks across the multiple parameter-specific assessment results that exist for a waterbody or segment within a waterbody and then consolidates the results into a final assessment. That is, DWQ assigns one EPA- and state-derived assessment decision category as defined in Table 1. To address the possibility of conflicting results among different types of data (e.g., biological versus conventionals, toxics versus *E.coli*), DWQ applies the policy of independent applicability and goes through a series of considerations to determine if the discrepancies are due to:

- Differences in data quality
- Environmental factors such as the application of the water effects ratio, development of site-specific criteria, revision to numeric criteria in UAC R317-2, or conducting a UAA

Figure 16 elaborates on DWQ's use of the independent applicability policy.

In cases where concerns about the quality of independent datasets cannot be rectified through an evaluation and documentation of the QA/QC issues which resulted in accepting one dataset and the resulting assessment result, sites with conflicting assessment results may be listed as 3A (requiring additional study or monitoring) to better understand the seemingly conflicting lines of evidence. Specific assumptions regarding model applicability applied during the biological assessment process are discussed above. Similarly, if the application of water effects ratio, justifiable site-specific criteria change, or change in beneficial uses based

on a UAA cannot rectify the difference in the assessment results, then a 3A categorization may be warranted. All evaluations of conflicting assessment decisions will be made in consultation with EPA on a case-by-case basis.

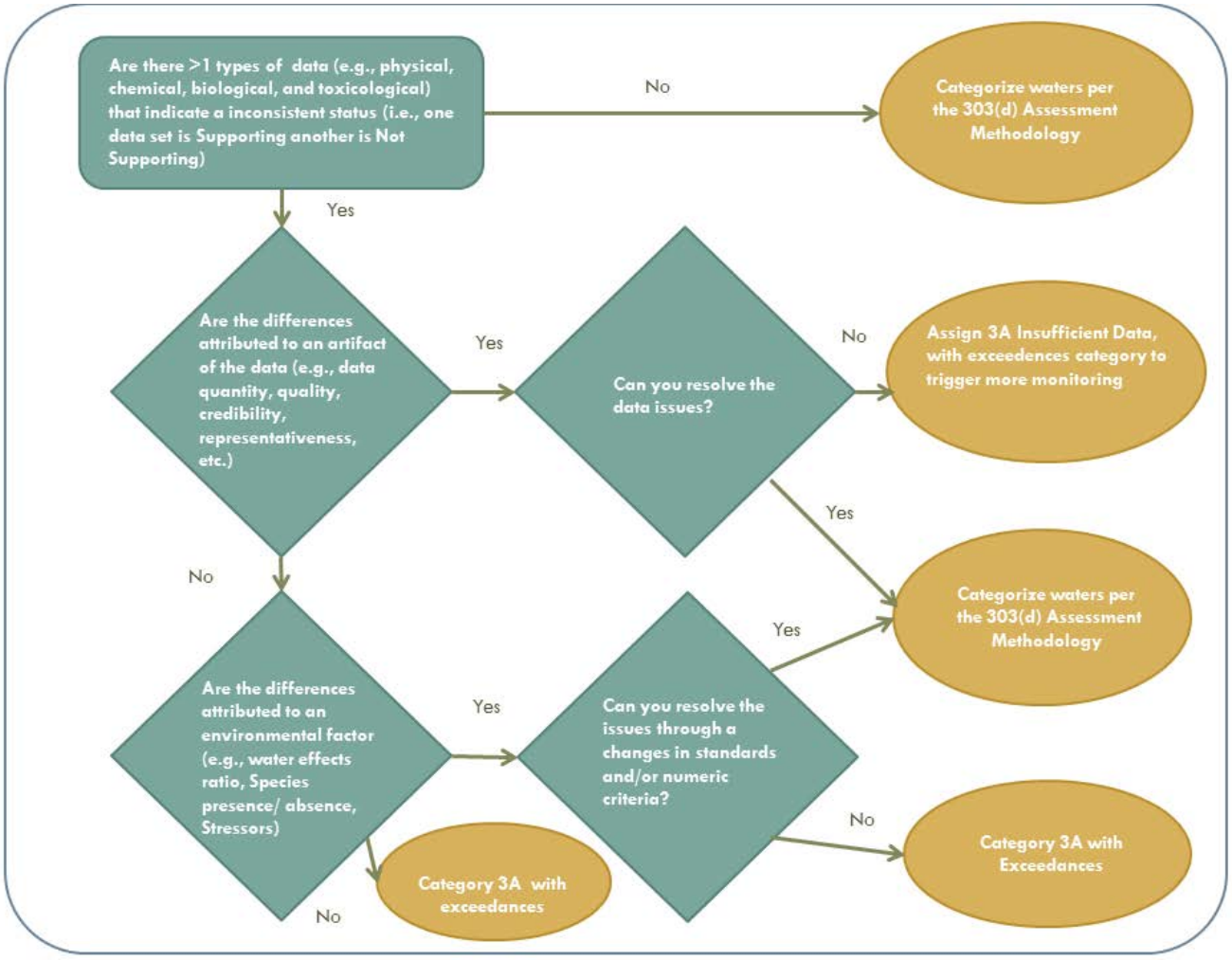


Figure 20. Overview of Independent Applicability Process.

Note: These judgment decisions are based in part on EPA's *Consolidated Assessment and Listing Methodology* guidance published in 2002

Narrative Criteria

In addition to the numeric criteria used to perform water quality assessments, Utah's water-quality standards contain provisions for the application of narrative criteria to protect uses. The narrative criteria state:

> "It shall be unlawful, and a violation of these rules, for an person to discharge or place any waste or other substance in such a way as will be or may become offensive such as unnatural deposits, floating debris, oil, scum, or other nuisances such as color, odor to taste; or cause conditions which produce undesirable aquatic life or which produce objectionable tastes in edible aquatic organisms; or result in concentration or combinations of substance which produce undesirable human health effect, as determined by bioassay or other tests performed

in accordance with standard procedures; or determined by biological assessments in (UAC) Subsection R317-2-7.3."

Under circumstances where evidence exists that human-caused actions have produced any of these undesirable outcomes in a waterbody, DWQ will apply the narrative criteria to protect human health and aquatic life. Examples where the Narrative Standards may be used to make an impairment determination include drinking-water closures, fish kills, beach closures for swimming, and health advisories for the consumption of fish. The assessment of *E. coli* data and associated beach closures to protect human health is an additional weight of evidence for defining the impairment of recreational uses and is addressed in more detail earlier in this document in the *E. coli* data assessment section. DWQ will also apply a cyanobacterial cell count threshold for determining impairments due to harmful algal blooms (see Lakes assessment section).

Drinking Water Closures

If Utah's Division of Drinking Water or a local municipality issues an advisory or closure for a surface drinking water source, DWQ will assess the site as impaired for 1C uses, unless data show that the problem has been solved.

Fish Kills

DWQ requests information on reported fish kills from Utah's Division of Wildlife Resources (DWR) and other stakeholders. These data are used in concert with water quality data to make final assessment decisions. For example, sites that would generally not be assessed due to small sample sizes may be listed as impaired if fish kills have also been observed in the waterbody.

Beneficial Use Assessment Based on Tissue Consumption Health Advisories

Human health consumption advisories are issued by UDOH in conjunction with DWQ, DWR, and local health departments. DWQ and UDOH developed a sampling protocol based on statistical analyses to determine the minimum number of fish samples to use in an advisory. The statistical parameters are as follows:

- The probability of a Type I error is set at 10 percent. A Type I error is when the average concentration in fish is concluded to be greater than the screening level when the actual average concentration is equal to or less than the screening level.
- The probability of a Type II error is set at 20 percent. A Type II error is when the average concentration in fish is concluded to be equal to or less than the screening level when the actual average concentration actually exceeds the screening level by more than the minimum detectable difference.
- The minimum detectable difference is set at 0.15 milligram per kilogram (mg/kg). For instance, for mercury health advisories, the screening levels for consumption advisories are 0.3 mg/kg, so under the minimum conditions described above, the average concentration would have to be 0.45 mg/kg before the desired level of confidence in the results is achieved.

If the required confidence is not achieved, additional samples are required. Type I and Type II errors are inversely proportional when the number of samples and minimum detectable difference are held constant. For instance, achieving a reduction in the Type II error probability would require a corresponding acceptance of an increase in the Type I error probability. If the average contaminant concentrations in fish are greater than 0.45 mg/kg, then both Type I and Type II error probabilities are reduced.

Mercury

The current approach for making assessments of aquatic life use support from mercury consumption advisories is different for advisories based on birds than for those based on fish (Fig. 2-8). Fish are constant residents of the waterbodies where they are collected, whereas waterfowl migrate across large areas. As a result, it is difficult to directly tie waterfowl tissues higher in mercury directly to an AU.

Although advisories for human health help guide decisions regarding attainment of Aquatic Life Uses, they are not equivocal. Currently, health advisories are issued if the mercury concentration in fish tissue is 0.3 parts per million (0.3 mg/kg wet weight, or 0.3 micrograms per gram [µg/g]). This concentration is recommended by EPA, but it is less than the U.S. Food and Drug Administration value of 1.0 mg/kg. The U.S. Food and Drug Administration set the consumption concentration at 1.0 mg/kg, which correlates to the water column mercury concentration of 0.012 µg/liter (L) in previous studies by EPA (EPA, 1985). Utah's water quality standard for mercury is 0.012 µg/L as a four-day average. Therefore, the corresponding fish tissue concentration of 1.0 mg/kg is used for assessment.

DWQ works in collaboration with the Utah Department of Health (UDOH), which issues consumption advisories at sites where high mercury concentrations are observed in animal tissues. For additional information, please visit the **Utah Fish Advisories website**.

Beneficial Use Supported
No fish consumption advisories for mercury, or the fish tissue mercury concentration is less than or equal to 1.0 mg/kg.

Beneficial Use Not Supported
Fish consumption advisory for mercury is in place, and fish tissue mercury concentration is greater than 1.0 mg/kg.

Overwhelming Evidence

Following the consolidation of all of the individual assessment results and data information that exist for a waterbody or segment within a waterbody, DWQ will review individual listing decisions if there is overwhelming evidence of a waterbody or segment of a waterbody supporting or not supporting its associated beneficial uses and numeric criteria in UAC R317-2.

Where there is a lack of overwhelming evidence of a waterbody or segment within a waterbody supporting or not supporting its beneficial uses, best professional judgment (BPJ) can be used to verify a preliminary assessment. Where this is overwhelming evidence for credible data as defined earlier in this document, assessment decision are considered confirmed.

Best Professional Judgment (BPJ)

DWQ recognizes that BPJ from internal and external reviewers during the public comment periods may provide useful feedback on determining the strength of the quantity of data and the extent to which such data demonstrates clear and convincing evidence of a waterbody or segment of a waterbody supporting or not supporting its beneficial uses and numeric criteria. To ensure consistency in when and how BPJ is used among

different professionals, DWQ will use BPJ in a select number of scenarios using a standard set of guidelines. Appendix 9 elaborates on when and how DWQ's assessment and 303(d) BPJ policy will be implemented.

Where BPJ documentation for overriding a preliminary assessment decision is insufficient in strength, vague, or cannot be provided, the preliminary-assessment decision based on the data-assessment procedures outlined in this document will carry forward.

- Where BPJ documentation for overriding a preliminary assessment decision is sufficient in strength and can be provided, the preliminary assessment decision based on the data-assessment procedures outlined in this document will be overwritten. Preliminary listings for Category 5, Category 1, and Category 2 waters could be re-assinged as Category 3A, Insufficient Data with Exceedances.

For tracking and transparency to the public, DWQ will retain the original category assignment and a justification for the BPJ in the data files.

Categorization of an Assessment Unit

To summarize the water quality of a waterbody or segment of a waterbody, DWQ compiles and aggregates all credible and representative water quality data from multiple data sources and sampling sites into one EPA- and state-derived assessment category for the Assessment Unit (Table1). Appendix 5 elaborates on the processes and procedures DWQ goes through when rolling up the individual assessments that have undergone the reviews and considerations outlined earlier in this document into one category for each defined AU within the state. For a brief summary on how DWQ summarizes the individual assessments at a monitoring location site to an AU, see Fig. 21.

Assessment of "All Tributaries" Segments

If after aggregating all of the assessments into one EPA- and state-derived assessment category for an AU, DWQ believes that there is some reason that the supporting or not supporting assessment result decision is not representative of the entire AU, DWQ will investigate further to determine whether the supporting or not supporting decision is widespread or limited to individual portions of the waterbody, such as specific tributaries or reaches. Results from the above analysis will be categorized as follows:

- Whole AU is Category 5, Not Supporting

  If all of the data from multiple tributaries within a segment indicate only (or a combination of) not supports (Category 5) and (Category 3A) Insufficient Data with Exceedances, DWQ will recommend that the entire AU be listed as not supporting.

- Only Not Supporting Tributaries are listed as Category 5, Not Supporting

  If data from one or more tributaries indicate a combination of any of the following, DWQ will recommend that only the tributaries with data indicating an impairment be listed as Not Supporting:

- Supporting (Category 1)
- No Evidence of Impairments (Category 2)
- Insufficient Data with Exceedances (Category 3A)
- Insufficient Data with No Exceedances (Category 3E)
- Needs Further Investigations (Category 3D
- Not Assessed (Category 3F)

The rest of the AU will be assigned a category following procedures as outlined in Figure 21.

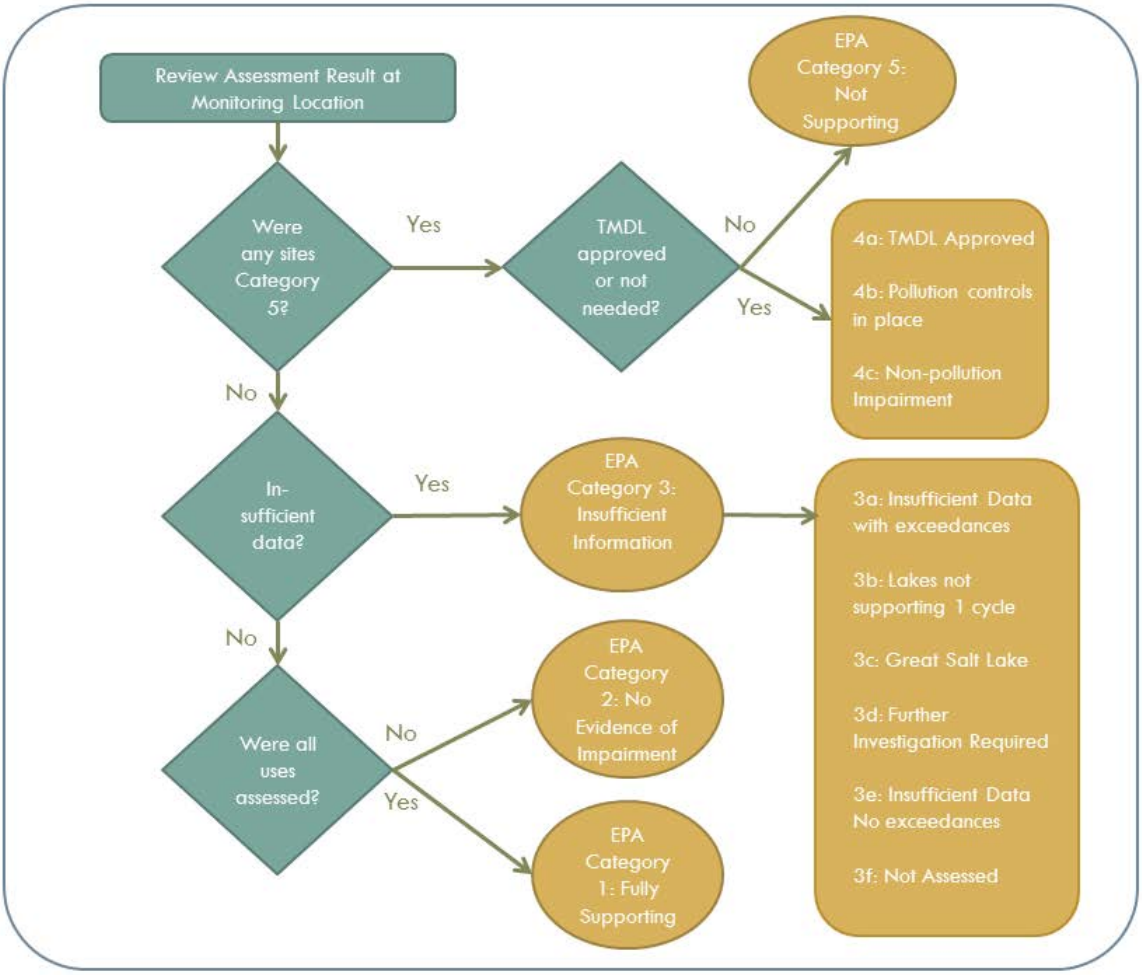


Figure 21. Process of Assigning EPA Categories to AUs Based on Results of Monitoring-Location Assessments

IDENTIFYING CAUSES OF IMPAIRMENTS

Once an AU is assigned an EPA- and state-derived assessment category that is representative of conditions with the Assessment Unit, DWQ will determine if the impairment(s) are driven by pollutants, pollution, unknown, or natural causes (Table 1). With the exception of naturally occurring causes, only one cause will be applied to a not-supporting waterbody and parameter. Procedures on how DWQ identifies the cause of impairments are described in more detail below.

Pollutants

Using the CWA's definition of a pollutant as a guide, DWQ defines pollutant driven impairments (Category 5) as those resulting from:

> *"dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under Atomic Energy Act of 1954, as amended), heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water."*

Notwithstanding the federal definition cited above, DWQ will also identify certain radiological constituents that are regulated under the state's Water Quality Control Act. For the purpose of the 303(d) list, causes for impairments due to toxic parameters will be identified as the parameter for which there is an impairment. In the case of conventional parameters such as dissolved oxygen, temperature, pH, and biological scores, the cause will be assigned as "unknown" until such time as a TMDL or pollution prevention plan identifies the cause of the impairment.

Once an impairment for a waterbody or segment within a waterbody is identified as pollutant-driven, DWQ will list the waterbody and the not-supporting parameter(s) as impaired for that pollutant (e.g., cadmium, iron, etc.). Waterbodies that are not supporting their beneficial uses due to pollutant impairments require future development of a TMDL or application of a TMDL alternative. Information on DWQ's process of prioritizing and developing a TMDL, and TMDL alternatives, is described later in this document and on DWQ's website.

Pollution

Where DWQ can identify that an impairment was not driven by a pollutant, DWQ will next consider if the not-supporting assessment was driven solely by pollution versus a pollutant or by an unknown cause. Using the CWA's definition of pollution as a guide, DWQ will go through an evaluation to determine if an impairment resulted from "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." Waterbodies and not-supporting parameters that are driven solely by pollution problems do not require the future development of a TMDL and are candidates for a Non-Pollutant Impairment (4C) assessment category. Details on DWQ's process for using EPA's 4C assessment category are described later in this document.

Unknown Causes

In cases where an impairment decision is not based on a numeric criterion such as a biological assessment or other lines of evidence, it may not be immediately possible to assign a specific cause for the impairment. Under these circumstances, DWQ will list the site as impaired (Category 5) with the cause being unknown. Within 12 years, or two DWQ rotating basin cycles from when the waterbody and not-supporting parameter(s) were first listed, DWQ will identify or show demonstrated progress towards identifying the cause of impairment.

Natural Conditions

In cases where DWQ or a stakeholder can demonstrate that the natural conditions of the waterbody or segment within a waterbody are the key factor for an impairment(s), DWQ will still retain the not-supporting assessment decision. However, DWQ's response to such exceedances differs unless a site-specific standard has been promulgated. Site-specific standards require documentation that demonstrates the extent to which the violations were due to natural conditions. Once this documentation is developed, the proposed changes to standards will be developed. For more information on the review and approval process for developing standards and numeric criteria surrounding exceedances caused by naturally occurring conditions, please review **DWQ's Standards website**.

REVISING THE 303(D) LIST AND OTHER CATEGORICAL ASSESSMENTS

Upon validating the strength and extent of the impairments within a waterbody or segment within a waterbody, DWQ will include newly proposed and previously listed not-supporting (Category 5) waterbodies on the updated 303(d) List unless the waterbody or waterbody segment(s) are currently included in the IR's TMDL Approved (Category 4A), Pollution Control (Category 4B), Non-Pollutant Impairment (Category 4C), or De-listing Lists. Details on how and when DWQ will not apply or carry an impaired listing (Not Supporting, Category 5) forward on DWQ's 303(d) List are described below.

Category 4A

The first alternative DWQ has available for not listing or removing an impaired waterbody or segment within a waterbody on the State's 303(d) List is to calculate the maximum amount of a pollutant that a waterbody can receive while still meeting the state's water quality standards. This calculation and analysis work must be formalized in a TMDL and go through a thorough internal and external review process. This calculation and analysis work must be formalized in a TMDL and submitted for approval from the Natural Resource Committee (for implementation costs exceeding $10 Million), the state legislature (for implementation costs over $100 million), and EPA. Information on DWQ's process for developing and implementing a TMDL can be found on **DWQ's Watershed Protection** website and **EPA's TMDL 303(d) website**. Where DWQ has documentation of a DWQ Water Quality Board- and EPA-approved TMDL for an impaired parameter within a not-supporting waterbody or segment within a waterbody, DWQ will override a current or previous Not Supporting Category 5 listing decision at the AU level as follows:

- Whole AU Category 4A, TMDL Approved if:

  The only impairments within the waterbody or segment within the waterbody are included in the approved TMDL.

  There are additional impairments within the waterbody or segments within the waterbody that are addressed in a Category 4B Demonstration Plan (described below in this document) and are not included in the approved TMDL If the parameters included in the approved Category 4B Demonstration Plan are still Not Supporting or are Insufficient Data with Exceedances in the current assessment cycle, DWQ will indicate that those parameters have an approved Category 4B Demonstration Plan in place.

  There are additional impairments within the waterbody or segments within the waterbody that are pollution- driven (Category 4C) and not included in the approved TMDL. If the pollution-driven parameters are still not supporting or are insufficient data with exceedances in the current assessment cycle, DWQ will indicate that those parameters are pollution- versus pollutant-driven.

- Whole AU Category 5, Not Supporting if:

  There are any additional pollutant impairments within the waterbody or segments within the waterbody that are not included in the approved TMDL. If the parameters included in the approved TMDL are still not supporting or are insufficient data with exceedances in the current assessment cycle, DWQ will indicate that those parameters have an approved TMDL in place.

Category 4B

DWQ's second alternative to not listing or removing an impaired waterbody or segment within a waterbody on the state's 303(d) List is to develop a plan that ensures upon implementation that the waterbody will meet state water quality standards within a reasonable time period and through state- and EPA-approved

pollution control mechanisms. Similar to a TMDL, a Category 4B Demonstration Plan must go through a robust internal and external review process. For example, once DWQ or a stakeholder develops a plan for consideration, DWQ will present the plan to DWQ's Water Quality Board and submit the board-approved plan to EPA for final approval. More information on the Category 4B Demonstration Plan process can be found on DWQ's Watershed Protection website and in EPA's "**Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act**" and "**Information Concerning 2008 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions**".

Where DWQ has documentation of an EPA-approved Category 4B Demonstration Plan for an impaired parameter within a not-supporting waterbody or segment within a waterbody, DWQ will override a current (or previous) not-supporting Category 5 listing decision at the AU level as follows:

- Whole AU Category 4A, TMDL Approved if:

  There are any additional impairments within the waterbody or segments within the waterbody that are addressed in an approved TMDL (Category 4A) and are not included in the approved Category 4B Demonstration Plan. If the parameters included in the approved Category 4B Demonstration Plan are still Not Supporting or are Insufficient Data with Exceedances in the current assessment cycle, DWQ will indicate that those parameters have an approved Category 4B Demonstration Plan in place.

- Whole AU Category 4B, Pollution Control if:

  The only impairments within the waterbody or segment within the waterbody are included in the approved Category 4B Demonstration Plan

  There are additional impairments within the waterbody or segments within the waterbody that are pollution-driven (Category 4C) and are not included in the approved Category 4B Demonstration Plan. If the pollution-driven parameter impairments are still Not Supporting or are Insufficient Data with Exceedances in the current assessment cycle, DWQ will indicate that those parameters are pollution- rather than pollutant-driven.

- Whole AU Category 5, Not Supporting if:

  There are any additional pollutant impairments within the waterbody or segments within the waterbody that are not included in the approved Category 4B Demonstration Plan. If the parameters included in the approved Category 4B Demonstration Plan are still Not Supporting or are Insufficient Data with Exceedances in the current assessment cycle, DWQ will indicate that those parameters have an approved Category 4B Demonstration Plan in place.

Category 4C

The third alternative for not listing or removing an impaired waterbody or segment within a waterbody on the State's 303(d) List is to demonstrate that the parameter-specific impairment(s) are driven by pollution and not by a pollutant or pollutant that causes pollution. Unlike a TMDL or Category 4B Demonstration Plan, the analysis works to determine if the cause of impairment is driven by pollution does not require formal approval from DWQ's Water Quality Board or EPA. Pollution analysis work is instead reviewed internally by DWQ and by stakeholders during the public comment period of the Draft IR and 303(d) List.

For the draft IR and 303(d) List, DWQ will temporarily assume "approval" of any pollution-driven analysis work and supersede a current or previous Not Supporting Category 5 listing decision at the AU level as follows:

- Whole AU Category 4A, TMDL Approved if:

  All impairments within the waterbody or segments within the waterbody are addressed in an approved TMDL (Category 4A) For pollution-driven impairments that are still Not Supporting or are Insufficient Data with Exceedances in the current assessment cycle, DWQ will indicate that those parameters are pollution- rather than pollutant-driven.

- Whole AU Category 4B, Pollution Control if:

  All impairments within the waterbody or segments within the waterbody that are addressed in an approved Category 4B Demonstration Plan. For pollution-driven impairments that are still Not Supporting or are Insufficient Data with Exceedances in the current assessment cycle, DWQ will indicate that those parameters are pollution-driven.

- Whole AU Category 4C, Non-Pollutant Impairment if:

  The only impairments within the waterbody or segment within the waterbody are included in the approved Category 4B Demonstration Plan.

- Whole AU Category 5, Not Supporting if:

  There are any additional pollutant impairments within the waterbody or segments within the waterbody. The pollution-driven impairments that are still Not Supporting or are Insufficient Data with Exceedances in the current assessment cycle, DWQ will indicate that those parameters are pollution-driven.

DWQ will provide to stakeholders during the public comment period of the draft IR and 303(d) List documentation as to why the impaired parameter within the waterbody or segment within the waterbody is pollution- and not pollutant-driven and won't require the future development of a TMDL.

De-listings

The fourth and final alternative DWQ has to not listing or removing an impaired waterbody or segment within a waterbody on the State's 303(d) List is to demonstrate good cause to stakeholders and EPA that the previously impaired parameter and waterbody or segment within a waterbody are now meeting water-quality standards in UAC R317-2. Good cause occurs when DWQ can demonstrate one or more of the following categories and scenarios:

- Improvements in watershed conditions:
  Due to implementation of nonpoint source projects and/or revised effluent limits the waterbody has improved such that post-implementation data indicates that the impairment has been resolved. This assessment may be based on additional data, beyond that which is typically used in assessments, including before and after project implementation monitoring. In some cases, demonstration of improvement may be based on a different time period for data collection that corresponds with known watershed improvements.
- Changes to Water Quality Standards

Adoption of revised water quality standards and/or uses such that the water is now in attainment of the revised standards and/or uses

- Changes to the 303(d) Assessment Methodology

  Development of a new listing methodology consistent with the state water-quality standards and classifications and federal listing requirements. This includes all information contained in this document and credible data requirements posted on DWQ's **Call for Data website**.

- Reassessment (new data and information)

  Assessment and interpretation of older data that was not originally included in the previous assessment and/or more recent or more accurate data that demonstrates that the applicable classified uses and numeric and narrative standards are being met.

- Geo-location Information Error

  Inappropriate listing of a water that is located within Indian lands as defined in U.S.C. § 1151

- Analysis Errors

  Flaws in the original analysis of data and information that led to the waterbody-pollutant combination being incorrectly listed. Such flaws may include:

  - Calculation errors in the data assessment methods outlined in the 303(d) assessment methodology from that Assessment cycle
  - Errors produced when reviewing credible and representative data information,
  - Mapping errors generated during the validation of sampling location information and assigning AU designations,
  - Discrepancies between the beneficial use assignments in UAC R317-2 and the IR geo-location information files for internal and external data,
  - Wrong identification and assessment of a waterbody type
  - Application of the wrong numeric criteria to a beneficial use.

- New Modeling:

  Results of more sophisticated water-quality modeling that demonstrate that the applicable classified uses and numeric and narrative standards are being met

- Effluent Limitations

  Demonstration pursuant to 40 CFR 130.7(b)(1)(ii) that there are effluent limitations required by state or local authorities that are more stringent than technology-based effluent limitations, required by the CWA, and that these more stringent effluent limitations will result in attainment of classified uses and numeric and narrative standards for the pollutant causing the impairment.

- Other

  There is other relevant information that supports the decision not to include the segment on the section 303(d) list.

There are two mechanisms for justifying a delisting based on assessment results:

- Delisting an AU for all parameters
- Delisting individual parameters for an AU

To demonstrate good cause, DWQ will compare the previous IR cycle's final assessment categories and 303(d) List to the current IR's assessment categories and 303(d) List. Where differences in categorical assignments exist, DWQ will only further investigate the following scenarios for good cause:

- The AU/waterbody or segment within the waterbody was previously Not Supporting (Category 5) and is now Supporting (Category 1), shows No Evidence of Impairment (Category 2), or has Insufficient Data with No Exceedances (Category 3E)
- The AU/waterbody or segment within the waterbody was previously Not Supporting but had an approved TMDL (Category 4A) and is now Supporting (Category 1), shows No Evidence of Impairment (Category 2), or has Insufficient Data with No Exceedances (Category 3E)
- The AU/waterbody or segment within the waterbody was previously Not Supporting but had an approved Category 4B Demonstration Plan and is now Supporting (Category 1), shows No Evidence of Impairment (Category 2), or has Insufficient Data with No Exceedances (Category 3E)
- The AU/waterbody or segment within the waterbody was previously Not Supporting but had pollution-driven impairment (Category 4C) and is now Supporting (Category 1), shows No Evidence of Impairment (Category 2), or has Insufficient Data with No Exceedances (Category 3E)

Note: The next set of scenarios describes the methods that apply to delisting individual parameters rather than entire AUs.

- A parameter within an AU/waterbody (or segment within the waterbody) was previously Not Supporting (Category 5) and is now Supporting (Category 1), shows No Evidence of Impairment (Category 2), or has Insufficient Data with No Exceedances (Category 3E).
- A parameter within an AU/waterbody (or segment within the waterbody) was previously Not Supporting but had an approved TMDL (Category 4A) and is now Supporting (Category 1), shows No Evidence of Impairment (Category 2), or has Insufficient Data with No Exceedances (Category 3E).
- A parameter within an AU/waterbody (or segment within the waterbody) was previously Not Supporting but had an approved Category 4B Demonstration Plan and is now Supporting (Category 1), shows No Evidence of Impairment (Category 2), or has Insufficient Data with No Exceedances (Category 3E)
- A parameter within an AU/waterbody (or segment within the waterbody) was previously Not Supporting but had pollution-driven impairment (Category 4C) and is now Supporting (Category 1), shows No Evidence of Impairment (Category 2), or has Insufficient Data with No Exceedances (Category 3E).

Where assessment category assignments at the AU and parameter level warrant a further investigation for good cause as articulated above, DWQ will reevaluate the data from:

- The period of record from when the AU and/or parameter was first listed
- The period of record in the current assessment cycle
- The data that was collected between when the AU and/or parameter was first listed and the period of record considered in the current assessment cycle

Appendix 6 elaborates on the process DWQ will follow when evaluating good cause at the AU-level, and also describes, in more detail, the process DWQ will go through when evaluating good cause at the parameter level.

If a waterbody or parameter is shown to have good cause for not being listed or removed as an impaired waterbody or segment within a waterbody on the state's 303(d) List, DWQ will state the good cause as defined earlier in this document and provide a more detailed description of the good cause. Details of the good-cause evaluation process such as the data-analysis work will not be posted online during the draft public comment period or after the final approval and publication of the final IR and 303(d) List. DWQ will, however, summarize the data analysis work in the description of the good cause. The analyses will be available to the public upon request through Utah's GRAMA requirements.

Previous Categorical Listings

303(d) Listings

Without the proper documentation, as described above, to support changing a previous not-supporting (Category 5) listing decision to a TMDL Approved (Category 4A), Pollution Control (Category 4B), Non-Pollutant Impairment (Category 4C), or De-listing (demonstration of good cause), DWQ must continue to list all previous impairments. At a minimum, this includes carrying forward all waterbodies or segments within a waterbody that were previously Not Supporting (Category 5), indicating the cause of impairment, listing the beneficial use(s) that are failing to meet water quality standards, providing the priority of developing a TMDL, and indicating the cycle the waterbody or segment within the waterbody were first listed.

Non-303(d) Categorical Listings

Where DWQ has the proper documentation to support changing a previous Not Supporting (Category 5) listing decision to a TMDL Approved (Category 4A), Pollution Control (Category 4B), Non-Pollutant Impairment (Category 4C), or De-listing (demonstration of good cause), DWQ will do so as outlined by the policies and procedure described earlier in this document.

DWQ will also carry forward all previous categorizations of waterbodies or segments within a waterbody if the waterbody does not have any credible or representative data from the period of record of the current assessment cycle (a six-year period of record). This includes carrying forward:

- Previous TMDL Approved (Category 4A), Pollution Control (Category 4B), Non-Pollutant Impairment (Category 4C) categorizations that do not demonstrate good cause as defined earlier in this document

- Previous categorizations that have Insufficient Data with Exceedances (Category 3A), require Further Investigations (Category 3D), have Insufficient Data with No Exceedances (3E), are Not Assessed (Category 3F), show No Evidence of Impairment (Category 2), or are Supporting (Category 1)

Waterbodies or segments within a waterbody that are supporting or show no evidence of impairment may carry forward for 6 consecutive assessment (or 2 rotating basin) cycles. On the seventh consecutive assessment cycle, DWQ will not continue to carry forward a Supporting or No Evidence of Impairment categorization for waterbodies or segment within a waterbody that do not have any new data collected in the last 12 years. As noted earlier in this document, data older than a 12-year period of record may not be reflective of current condition, and will not be used for assessment purposes unless there is information or a rationale with supporting documentation that shows the data are reflective of current conditions.

If there is evidence that the data are reflective of current conditions, the previous Supporting (Category 1) or No Evidence of Impairment (Category 2) categorization will carry forward for one more assessment cycle (the current one) and be re-evaluated in the next cycle. If there is no or not enough supporting evidence that the data are reflective of current conditions, DWQ will not carry forward the Supporting or No Evidence of Impairment categorization for a seventh consecutive assessment cycle. Instead, DWQ will change the categorization to Insufficient Data No Exceedances (Category 3E) to prioritize and encourage DWQ and stakeholders to collect newer information and submit that data and information in future calls for data.

303(D) VISION AND TMDL PRIORITY DEVELOPMENT

For waterbodies or segments within a waterbody that are impaired by a pollutant, DWQ must ensure that TMDLs will be developed following the final release of the current IR and 303(d) List. Recognizing that all TMDLs cannot be completed at once and that certain risks may be greater than others, the Clean Water Act section allows states to prioritize impaired waterbodies or segments within a waterbody on the Section 303(d) List for the future development of TMDLs.

To help guide states on how to best prioritize and demonstrate progress on addressing the water quality concerns highlighted and reported on in the IR and 303(d) List, EPA announced on December 5, 2013, a new collaborative framework for implementing the Clean Water Act Section 303(d) Program with states (See : **A Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program**). This document outlines a framework on how states can focus their resources to support the development of TMDLs and other water quality improvement programs (such as the Antidegradation Program, Nonpoint Source Implementation Program, and 401 Water Quality Certification program). In response to the release of this document, DWQ will be engaging with stakeholders while updating and developing new policies and procedures for the following IR and 303(d) reporting-specific elements:

- Assigning TMDL priorities to impaired waterbodies and segments within waterbodies on DWQ's 303(d) List
- Performing cost/benefit analyses that estimate the environmental, economic, and social costs and benefits, and time needed to achieve the objectives of the CWA and state water-quality standards
- Tracking the statuses and developments of TMDLs

DWQ is scheduled to release its new state-specific 303(d) vision policy and procedures in 2015 for public comment and final approval from EPA (Table X). To minimize the potential for conflicting information between the release of the Draft 2016 IR and 303(d) List and the public comment period and adoption of the DWQ 303(d) Vision, DWQ will carry forward the TMDL priorities from previous impairments and 303(d) Lists and

not prioritize new pollutant-driven impairments until the 2018 assessment cycle. Please refer to Appendix 7 for how DWQ prioritized the future developments of TMDLs on DWQ's 303(d) List.

Table 12. Milestones for 303(d) Vision Prioritization Process

Presentation to WQ board	1/21/15
Criteria Development and Application	
Compile all priorities and criteria developed internally	1/15/15
Rank criteria and priorities based on DWQ needs and mission	2/06/15
Apply criteria to 303d list using spreadsheet ranking tool	2/20/15
Report	
Internal draft of 303(d) priorities report	3/15/15
Evaluation of DWQ resources for high priorities (funding/feasibility)	4/01/15
Internal review	4/15/15
Public draft report	4/30/15
Public comment period	5/01 - 6/01/15
Final draft report	6/28/15

REVISION REQUESTS BETWEEN CYCLES

Barring unforeseen circumstances, DWQ will only propose to revise the IR and 303(d) Lists during the regularly scheduled reviews, which are currently biennially and on even-numbered years. Interested persons may petition DWQ at any time to request a revision to the IR and 303(d) Lists, whether it is an addition or deletion to the final 303(d) List. However, such revisions may only be considered upon a showing that failing to either add a segment to the list or delete a segment from the list prior to the next scheduled review will result in a substantial hardship to the party or parties requesting the revision(s). If such hardship is shown, DWQ will take the potential revision under strong consideration and begin a dialogue with the interested party or parties and EPA.

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APPENDIX 1: 2016 SUMMARY OF CHANGES AFTER PUBLIC COMMENT

This appendix is a place marker for changes made in response to public comments.

APPENDIX 2: 2016 METHODOLOGY PUBLIC COMMENTS RECEIVED

This appendix is a place marker for comments received during the public comment period.

APPENDIX 3: DWQ'S RESPONSE TO 2016 METHODOLOGY COMMENTS

This appendix is a place marker for a responsiveness summary table of public comments and DWQ response.

APPENDIX 4: 2016 IR CALL FOR DATA

This appendix is a place marker for the final version of the Assessment Methods . The Call for Data webpage can be accessed **here**.

APPENDIX 5 ASSESSMENT UNIT ROLL UP

Going from a multiple beneficial uses assessments for a parameter (i.e., a Parameter Summary Report) to 1 Parameter Category per Monitoring Location ID (MLID)*.

IRAnalysisAction: 3A: (insufficient Data)

- 1,2, or 3 exceedences (with **no** data rejected for a use)
  - 3Aexcceds is populated with a "Y" → ParamDWQCat: 3a → ParamEPACat: 3
- 1,2, or 3 exceedences (with **some** data rejected for a use)
  - 3Aexcceds is populated with a "Y" → ParamDWQCat: 3a → ParamEPACat: 3
- 0 exceedences (with **no** data rejected for a use)
  - No Data is populated with a "Y" → ParamDWQCat: 3e: Not Assessed → ParamEPACat: 3
- 0 exceedences (with **some** data rejected for a use)
  - No Data is populated with a "Y" → ParamDWQCat: 3e: Not Assessed → ParamEPACat: 3
- All data removed for every use
  - No Data is populated with a "Y" → ParamDWQCat: 3f: No Beneficial Uses → ParamEPACat: 3

IRAnalysisAction: Not Assessed

- All data removed for every use (this would be populated in use_comment columns)
  - No Data is populated with a "Y" → ParamDWQCat: 3e: Not Assessed → ParamEPACat: 3

IRAnalysisAction: Not Assessed

- **IRAnalysisComment:** "NonRejected data available for MLID/AU, but data available for individual use assessment was all rejected"
    - No Data is populated with a "Y" → ParamDWQCat: 3e: Not Assessed → ParamEPACat: 3

IRAnalysisAction: Not Assessed

- **IRAnalysisComment:** "No Uses assigned to site"
    - No Data is populated with a "Y" → ParamDWQCat: 3e: Not Assessed → ParamEPACat: 3

IRAnalysisAction: Assessed By Use

- **FS Only** → ParamDWQCat: 1 → ParamEPACat: 1
- **FS Only + some data rejected by use** → ParamDWQCat: ~~1~~ 2 → ParamEPACat: ~~1~~ 2
- **Contains an NS** → ParamDWQCat: 5 → ParamEPACat: 5
- **Only combo: all data was rejected for a use** → ParamDWQCat: 3e: Not Assessed → ParamEPACat: 3

- **FS Only + 3As by Use (exceedences) + some data rejected by use** → ParamDWQCat: 3a → ParamEPACat: 3
- **FS Only + 3As by Use (NO exceedences) + some data rejected by use** → ParamDWQCat: 2 → ParamEPACat: 2

- **FS Only + 3As by Use (exceedences) + NO data rejected by use** → ParamDWQCat: 3a → ParamEPACat: 3
- **FS Only + 3As by Use (NO exceedences) + NO data rejected by use** → ParamDWQCat: 2 → ParamEPACat: 2

- **3As by Use (exceedences) + some data rejected by use** → ParamDWQCat: 3a → ParamEPACat: 3
- **3As by Use (NO exceedences) + some data rejected by use** → ParamDWQCat: 3e: Not Assessed → ParamEPACat: 3

- **3As by Use (exceedences) + NO data rejected by use** → ParamDWQCat: 3a → ParamEPACat: 3
- **3As by Use (NO exceedences) + NO data rejected by use** → ParamDWQCat: 3e: Not Assessed → ParamEPACat: 3

- **BOD, TP, and Nitrate (for non 1C uses)** → ParameterDWQCat: MLIDDWQCat =3d: Further Investigations → ParamEPACat: 3

*Note: after this rollup there will be multiple parameter assessment categories for 1 MILD. For example, MLID "X" will have 1 Iron, 1 Copper, 1 Temperature, 1 Dissolved Oxygen, etc.

Going from many Parameter Categories within an MLID to 1 Category for the MLID

- Take MLID_Param Cats and Group them by MLID. Then assign the MLID category by the following logic:
  - **Parameter_DWQCat = 5 → MLIDDWQCat = 5 **AND** MLIDEPACat = 5
  - Parameter_DWQCat = 3a → MLIDDWQCat =3a **AND** MLIDEPACat = 3
  - Parameter_DWQCat = 1 → (Cat1 Matrix Check is a match)→MLIDDWQCat =1 **AND** MLIDEPACat = 1
  - Parameter_DWQCat = 1 → (Cat1 Matrix Check is a **NOT** a match)→MLIDDWQCat =2 **AND** MLIDEPACat = 2
  - Parameter_DWQCat = 2 →MLIDDWQCat =2 **AND** MLIDEPACat = 2
  - Parameter_DWQCat = 3d →MLIDDWQCat =3d: Further Investigations Needed **AND** MLIDEPACat = 3
  - Parameter_DWQCat = 3e →MLIDDWQCat =3e: Not Assessed **AND** MLIDEPACat = 3
  - Parameter_DWQCat = 3f →MLIDDWQCat =3f: No Beneficial Uses **AND** MLIDEPACat = 3

** Should be able to see a concatenation of the uses for a parameter that created a 5 category (needs validation too)

Going from many MLID Categories within an Assessment Unit (AU) to 1 Category for the AU

- Take MLID Cats and Group them by AUID. Then assign the AUID category by the following logic:
  - **MLIDDWQCat = 5 → AUIDDWQCat = 5 **AND** AUIDEPACat = 5
    - AUIDDWQCat = 5 (and TMDL in Place) → AUIDDWQCat = 5 **AND** AUIDEPACat = 4a
    - AUIDDWQCat = 5 (and non-TMDL in Place) → AUIDDWQCat = 5 **AND** AUIDEPACat = 4b
  - **MLIDDWQCat = 5 → (and TMDL is in place & only parameter assessed for that AUID is being considered) → AUIDDWQCat = 4a **AND** AUIDEPACat = 4a
    - AUIDDWQCat = 5 (and non-TMDL in place) → AUIDDWQCat = 4a **AND** AUIDEPACat = 4b
  - **MLIDDWQCat = 5 → (and non-TMDL is in place & only parameter assessed for that AUID is being considered) → AUIDDWQCat = 4b **AND** AUIDEPACat = 4b

        - NOTE: for the 2014IR this should not happen. The only 4Bs we have are KL's and AD's – may happen for AD's?
    - MLIDDWQCat = 3a → AUIDDWQCat =3a **AND** AUIDEPACat = 3
    - MLIDDWQCat = 2 →AUIDDWQCat =2 **AND** AUIDEPACat = 2
    - MLIDDWQCat = 1 →AUIDDWQCat =1 **AND** AUIDEPACat = 1
    - MLIDDWQCat = 3d → AUIDDWQCat =3d: Further Investigations Needed **AND** AUIDDWQCat = 3
    - MLIDDWQCat = 3e → AUIDDWQCat =3e: Not Assessed **AND** AUIDDWQCat = 3
    - MLIDDWQCat = 3f → AUIDDWQCat =3f: No Beneficial Uses **AND** AUIDDWQCat = 3

** Should be able to see a concatenation of the uses for a parameter that created a 5 category (needs validation too)

Extra Checks

Biological Assessments only assess 3A, 3B, 3C, or 3D beneficial uses. For an AU to be Category 1, all assigned beneficial uses must be assessed. Query AUs with Biological assessments in them and confirm that the AU assessment category follows the roll up process described in this document. One example is only a biological assessment is performed for an AU and the AU is Category 1 (should be changed to a category 2).

APPENDIX 6 DELISTING

1. Does the AU/ AU-parameter combination warrant further investigation? (see 303(d) Assessment Methodology for more details).
2. What was the AU originally impaired for?
3. What IR assessment cycle was the AU and parameter first listed?
    a. What data sets were used for that listing (e.g., the Agency/ sample collector)
    b. What was the period of record? (If unknown, use the longer period of record as defined in the 303(d) assessment methodology)
    c. What MLIDs are in the AU?
4. For impairments listed in the previous assessment cycle, compile the data. (Query data for all MLIDs in the AU. Ignore water body types)
    a. What MLID has >=1 exceedences
    b. For MLIDs with impairments/exceedences **and** not assessed in the current IR cycle: why did DWQ (or someone else) not resample? (Provide documentation why did not resample and why (by not re-sampling) the site should meet water quality standards. Please refer to the good cause descriptions in the 303(d) methodology. **Check for good cause.** If it is a reason other than good cause, the documentation will need to be EPA approved).
    c. Where all MLIDs with exceedences are assessed in the current IR cycle:
        i. For MLIDs with impairments/exceedences and the current parameter assessement for the MLID **is not** 1, 2, or 3e –> **no de-listing.**

ii. Is the current Parameter category 1, 2, or 3e? Was there a BPJ applied to this parameter (e.g., an assessment category overwrite for the whole:
    1. Parameter?
        a. If the BPJ created a category 1, 2, or 3e the BPJ justification will need to be EPA approved if it is consider to be a de-listing. **Check for good cause.**
    2. MLID?
        a. If the BPJ created a category 1, 2, or 3e the BPJ justification will need to be EPA approved if it is consider to be a de-listing. **Check for good cause.**
    3. AU?
        a. If the BPJ created a category 1, 2, or 3e the BPJ justification will need to be EPA approved if it is consider to be a de-listing. **Check for good cause.**

iii. Is the current Parameter category 1, 2, or 3e? (No BPJ applied to this parameter) → **Check for good cause.**

Note: Need to confirm that if no new data is collected the new assessment analysis isn't a cat 1,2, or 3e because the exceedences are out of the period of record for assessment analysis (i.e., not a delisting)

Double check before de-listing:

d. If the current Parameter category 1, 2, or 3e – what is the oldest date in that period of record for that MLID/Parameter combo in the current Assessment cycle?
e. For every MLID in the AU (Ignore water body types), compile all data for that parameter between the max date from the cycle the parameter was first listed and the oldest date in that period of record for that MLID/Parameter combo in the current Assessment cycle?
f. What MLID has >=1 exceedences
g. For MLIDs with impairments/exceedences **and** not assessed in the current IR cycle: why did DWQ (or someone else) not resample? (Provide documentation why did not resample and why (by not re-sampling) the site should meet water quality standards. Please refer to the good cause descriptions in the 303(d) methodology. If it is a reason other than good cause, the documentation will need to be EPA approved). **Check for good cause.**
h. Where all MLIDs with exceedence are assessed in the current IR cycle:
    i. For MLIDs with impairments/exceedences and the current parameter assessement for the MLID **is not** 1, 2, or 3e –> **no de-listing.**
    ii. Is the current Parameter category 1, 2, or 3e? Was there a BPJ applied to this parameter (e.g., an assessment category overwrite for the whole:
        1. Parameter?
            a. If the BPJ created a category 1, 2, or 3e the BPJ justification will need to be EPA approved if it is consider to be a de-listing. **Check for good cause.**
        2. MLID?
            a. If the BPJ created a category 1, 2, or 3e the BPJ justification will need to be EPA approved if it is consider to be a de-listing. **Check for good cause.**
        3. AU?

a. If the BPJ created a category 1, 2, or 3e the BPJ justification will need to be EPA approved if it is consider to be a de-listing. **Check for good cause.**

iii. Is the current Parameter category 1, 2, or 3e? (No BPJ applied to this parameter) → **Check for good cause**

Note: Need to confirm that if no new data is collected the new assessment analysis isn't a cat 1,2, or 3e because the exceedences are out of the period of record for assessment analysis.

APPENDIX 7 4B SUBMISSION POLICIES AND PROCEDURES

Process for Determining Category 4b Classification

An alternative to listing an impaired segment on the State's 303(d) List is an approved Category 4b demonstration plan. A Category 4b demonstration plan, when implemented, must ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period. These pollution control mechanisms can include approved compliance schedules for capital improvements or plans enforceable under other environmental statutes (such as CERCLA) and their associated regulations. A Category 4b demonstration can be used for segments impaired by point sources and/or nonpoint sources. Both the DWQ and EPA must accept a Category 4b demonstration plan for the affected segment to be placed in Category 4b. In the event that the Category 4b demonstration plan is not accepted, the segment at issue will be included on the 303(d) List, Category 5.

Generally speaking, the following factors will be considered necessary for Category 4b demonstration plan acceptance: (1) appropriate voluntary, regulatory or legal authority to implement the proposed control mechanisms (through permits, grants, compliance orders for Utah Pollutant Discharge Elimination System (UPDES) permits, etc.); (2) existing commitments by the proponent(s) to implement the controls; (3) adequate funding; and (4) other relevant factors appropriate to the segment.

The following evidence must be provided as a rationale for a Category 4b demonstration plan:

1) A statement of the problem causing the impairment;
2) A description of
    a. the pollution controls to be used
    b. how these pollution controls will achieve attainment with all applicable water quality standards
    c. requirements under which those pollution controls will be implemented;
3) An estimate of the time needed to meet all applicable water quality standards;
4) A schedule for implementation of the necessary pollution controls;
5) A schedule for tracking progress, including a description of milestones; and

6) A commitment from the demonstration plan proponent to revise the implementation strategy and pollution controls if progress towards meeting all applicable water quality standards is not shown.

Timing for proposal submittal and acceptance by DWQ and EPA

• Category 4b demonstration plans should be submitted to the Division by August 30, 2015 in order for the Division to submit the plan to EPA by September 6, 2015. Parties are encouraged to work with the Division prior to this date as states are the entity required to submit these plans to EPA.

• Acceptance from EPA must be obtained by October 31, 2015 otherwise the Division will continue to propose that the segment in question is included on the 2016 303(d) List.

• If EPA and DWQ accept the Category 4b Plan, the Division will notify the Utah Water Quality Board and the public through proposed Statement of Basis and Purpose language in its proposal that a Category 4b demonstration plan is accepted and is appropriate for this segment.

EPA has several documents that contain additional information on Category 4b demonstration requirements, including: "2006 Integrated Report Guidance," available at **http://www.epa.gov/OWOW/tmdl/2006IRG/#documents**; and "Information Concerning 2008 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions," available at: **http://yosemite.epa.gov/R10/WATER.NSF/TMDLs/CWA+303d+List/**.

APPENDIX 8 2014 IR TMDL PRIORITIZATION PROCESS

The Clean Water Act requires TMDLs be developed for all impaired waterbodies on the 303(d) list. Recognizing the many limitations in data, time, and staff resources to accomplish this, the Clean Water Act also requires states to prioritize where they will dedicate resources towards TMDL development. However, defining an impaired waterbody as high priority does not necessarily mean that a TMDL will be developed before lower priority segments. For some high priority TMDLs, the development may take considerably longer due to data collection, stakeholder involvement, and other factors.

The Utah Division of Water Quality prioritizes impairments to human and ecological health. These priorities translate into the protection and restoration of waters designated for culinary, recreational, and aquatic wildlife uses. Considerations for TMDL prioritization in Utah also include the level of partner agency and stakeholder involvement and potential for restoration as defined by the Recovery Potential Screening tool. Other factors that will be considered in setting TMDL priorities include programmatic needs such as permitting and addressing watershed-wide water quality issues.

The Division is currently engaged in an effort to solicit stakeholder input into the prioritization process as part of putting the 303(d) Vision into action. This effort is related but separate from the Integrated Report. Public input is critical for the success of the 303(d) vision as it will promote support for protecting and restoring water quality and define the values that best serve the public interest. The table below outlines milestones in the coming 6 months for developing a thoroughly vetted prioritization process.

APPENDIX 9 APPLICATION OF BEST PROFESSIONAL JUDGEMENT

BPJ Concern	Pre-BPJ Review Process	BPJ Application
Temporal Variation within a dataset	• Insufficient sampling frequency within an assessment period of record	Individual data records
Bias in Sampling Design	• Event monitoring (review flow, weather, and spill data, narrative criteria, field observations and photographs, satellite imagery, other data types collected in same (and around the) period of concern, etc). • Sample time of day (literature review to determine if parameter is impacted by the time of day sample is collected) • Sampling a specific season [unless s approved by DWQ in a SAP or is data-type specific (e.g., E. coli sampling during the rec. season)],	Individual data records
Data Quality	• QAPP • SAP • Field Calibration Documentation • Laboratory Method • SOPs • Demonstration of Capability (if applicable to data type) • Discussion with Sample Collector	Individual data records, and/or, Parameter(s) in period of record, and/or Monitoring Location

Wrongly Monitored	• Measured point source (vs. main water body), review imagery of area, flow, etc. • water body type DWQ does not assess (as defined in the 303(d) Methodology) • Grab sample vs. composite • Flow conditions (too low or not flowing) • Field Observation that impacts quality of data	Individual data records and/or Monitoring location
Outlier	Need more than a statistical test. Should be based on scientific or QA basis. • QAQC field sampling blanks, duplicates/replicate • Laboratory Analytical Batch QC • Value is nonsensical (e.g., cannot be measured with field/lab method) • Refer to Data Quality (above)	Individual data records
Magnitude of exceedance	• Significant figures • Review narrative criteria • …	Individual data records
QAQC Concerns	• Holding time • Laboratory Comment • Dilutions, Spikes • Other laboratory QC Performance Checks	Individual data records
Environmental Factors	• Extreme Event Captured [see definition of extreme event in 303(d) Assessment Methodology]: review flow, weather, and spill data, narrative criteria, field observations and photographs, satellite imagery, other data types collected in same (and around the) period of concern, etc).	Individual data records
Assessment Unit Grouping/ Spatial Variation	• Multiple locations not grouped correctly (either should or should not have been grouped) • Assessment of All Tributary Segments (please refer to 303(d) Assessment Methodology section on "All tributaries" for more information on the process) • Non-river/stream sampled in AU and is not supporting (this water body is still a water of the state and should be assessed. See the 303(d) Assessment Methodology for more details)	Monitoring location
Credible Data	• Data type applied incorrectly • Data type not considered. (Data type must meet credible and representative data requirements in 303(d) Assessment Methodology and if included in	Individual data records and/or Parameter(s) in period of record, Monitoring Location

	the assessment analysis would result in a change in the categorization of the water body and parameter.	
Other	• Parameters wrongly grouped (by CAS, Fraction, or Methodology) • Data Type is laboratory measurement (when the data assessment requires a field measurement) • IR QAQC Flagged Data • Errors in standards	Individual data records Entire parameter assessments